STATINTL

The System Lifecycle

BUDGETS DATA FEASIBILITY CHECKS

MISLEADING INFORMATION

ERRONEOUS ASSUMPTIONS

PROBLEM STATEMENT & ANALYSIS

OPERATIONAL REQUIREMENTS

EXPERIENCE FUZZY NOTION PERCEPTIONS

UTILITY STUDIES

OPTIONS

IMPACTS

INTERFACES CONCEPT DEFINITION

PRESHIP REVIEW CRITICAL DESIGN REVIEW PRELIM DESIGN REVIEW RQMTS REVIEW ANALYSES

RFP SOW CDRL TRADE STUDIES

OPERATIONS

ALLOCATIONS HDW:SW:OPS

PROPOSAL EVALUATION FACT-FINDING NEGOTIATION

DEVELOPMENT REQUIREMENTS INTERFACE DEFINITIONS

INSTALL & INTEGRATE PROD- UCTION & TEST PRODUCT SPECS DRAWINGS PRELIM. TEST PROCEDURES DEVELOPMENT SPECS INTERFACE SPECS PRELIM. TEST PLANS SCHEDULES

START OF ACQUISITION

STATINTL

WHERE REQUIREMENTS COME FROM

NEW CAPABILITIES
IMPROVED CAPABILITIES
PROBLEM RESOLUTION
IMPROVED EFFICIENCY
INTERFACE COMPATIBILITY

STATINTL

REQUIREMENTS DEFINITION PROCESSES

STATE THE PROBLEM
DEFINE THE PROPERTIES OF A SOLUTION
RESOLVE CONTRADICTIONS & INCONSISTENCIES
ESTABLISH DESIRED LEVELS OF PERFORMANCE
ORGANIZE, AMPLIFY & CLARIFY

STATINTL

Concepts of Usage

WHO DOES IT SERVE?
HOW DO THEY WORK?
HOW DOES IT FIT IN?
HOW DO WE THINK THEY WILL USE IT?
WHAT SUPPORT DOES IT NEED?
WHO WILL PROVIDE THAT SUPPORT?

BUDGETARY COST ESTIMATES

CONTROLLABLE ELEMENTS
Requirements
Design
Manufacturing

TASKS
Test
Documentation
Lifecycle Support

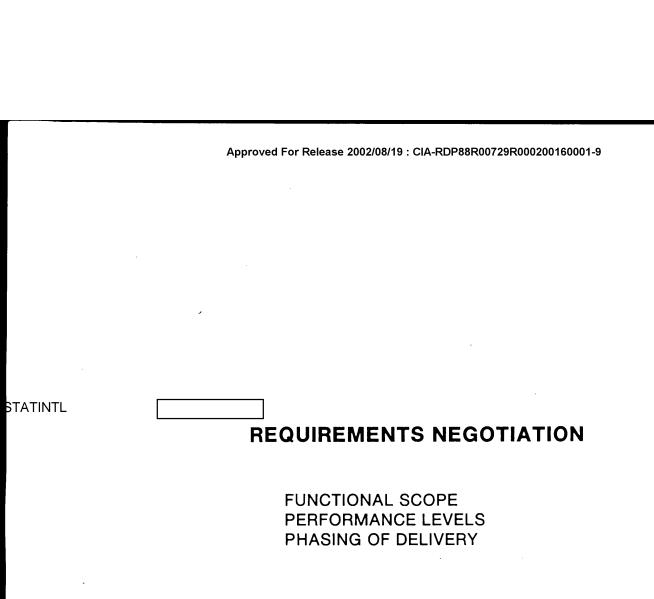## UNCONTROLLABLE ELEMENTS
Inflation
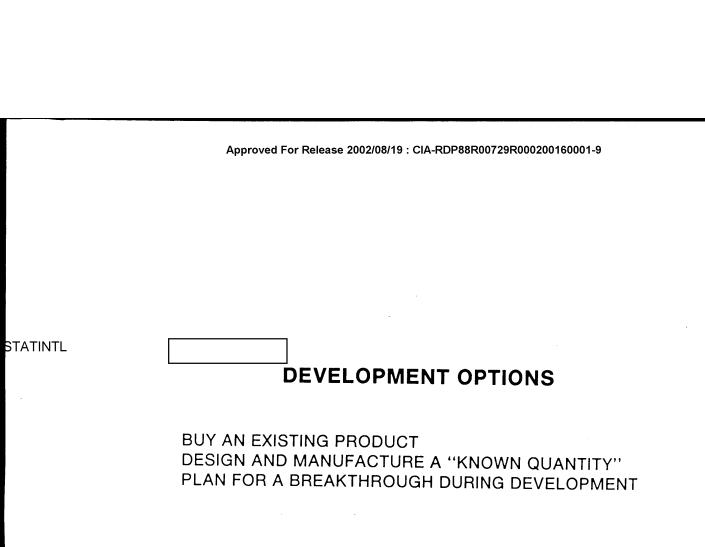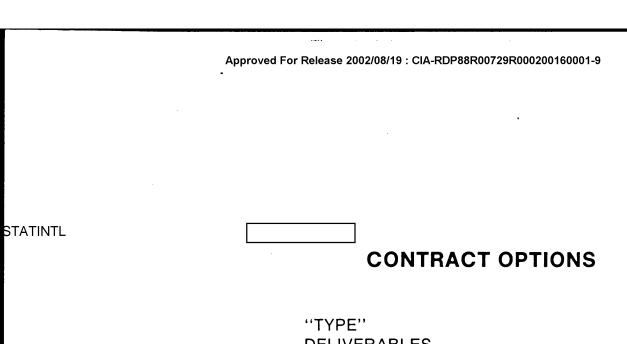Exchange Rates
Stretch-Out
Mission Urgency

CONTINGENCIES
Requirements Growth or Change
Technical Risk
Staffing Delays

STATINTL

REQUIREMENTS NEGOTIATION

FUNCTIONAL SCOPE
PERFORMANCE LEVELS
PHASING OF DELIVERY

BUDGETARY COST ESTIMATES

CONTROLLABLE ELEMENTS
Requirements
Design
Manufacturing

TASKS
Test
Documentation
Lifecycle Support

UNCONTROLLABLE ELEMENTS
Inflation
Exchange Rates
Stretch-Out
Mission Urgency

CONTINGENCIES
Requirements Growth or Change
Technical Risk
Staffing Delays

STATINTL

DEVELOPMENT OPTIONS

BUY AN EXISTING PRODUCT
DESIGN AND MANUFACTURE A "KNOWN QUANTITY"
PLAN FOR A BREAKTHROUGH DURING DEVELOPMENT

STATINTL

CONTRACT OPTIONS

"TYPE"
DELIVERABLES
DURATION AND SCHEDULE
PAYMENT TERMS
PERFORMANCE
CLAUSES

STATINTL

CHOOSING A CONTRACTOR

FIND QUALIFIED SOURCES
EXPLAIN YOUR PROBLEM AND NEED
COLLECT DATA FROM POTENTIAL CONTRACTORS
EVALUATE
NEGOTIATE
OBTAIN A CONTRACT
GO TO WORK!

STATINTL

MANAGING THE DEVELOPMENT PROCESS

ROLES

      REQUIREMENTS MANAGEMENT
      COST CONTROL
      SCHEDULE MANAGEMENT
      TECHNICAL RISK MANAGEMENT

TOOLS

      CONFIGURATION MANAGEMENT
      FINANCIAL REPORTS AND EVALUATION
      SCHEDULE TRACKING SYSTEMS
      TECHNICAL AUDITS AND REVIEWS

STATINTL

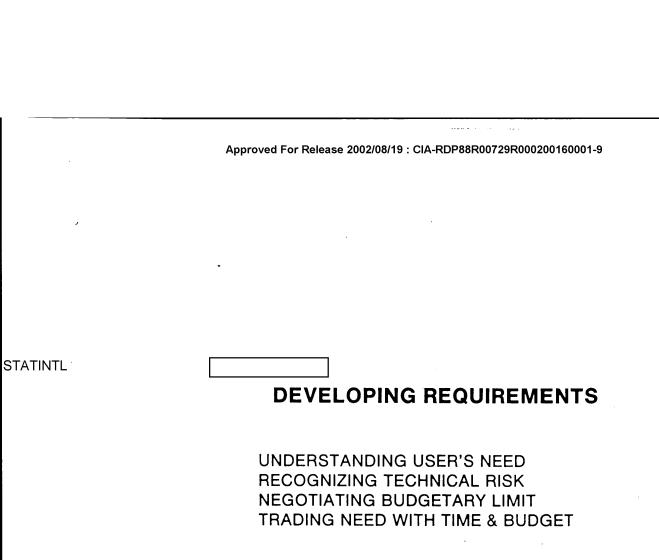# BUYING AND SELLING THE PRODUCT

BUYING

> TESTING
> EVALUATION
> AUDITS

SELLING

> BELIEVING
> EDUCATING
> CONVINCING
> TRAINING

STATINTL

COTR Activities

·terface ith Users	Coordinate IF's	Adopt System Architecture
·terpret lanagement 'riorities	Synthesize Alternatives	Develop Acquisition Plan
Aonitor Capabilities Industry	Manage Analyses	
	Evaluate Feasibility	
	Trade $vs Perf	

Manage
Competitive
Design
Studies

Develop
- Spec
- Conops
- ICD's

Proposal Evaluation/Fact Finding / Negotiation

Control & Assure Requirements

Monitor Budgets & Schedules

Resolve Interface Conflicts

Support & Defend Budget

Manage Design Reviews

Monitor Progress

Buy Off on Products
- Evaluate Test Results
- Perform Audits

"Sell"
The System

Manage New
Requirements

Fuzzy Notion	Problem Statement & Analysis	Concept Definition	Spec	Alloc.	Prelim. Design	Critical Design	Prod. & Test	Install & Integrate	Operations

Competitive   Contractual

STATINTL

DEVELOPING REQUIREMENTS

UNDERSTANDING USER'S NEED
RECOGNIZING TECHNICAL RISK
NEGOTIATING BUDGETARY LIMIT
TRADING NEED WITH TIME & BUDGET

STATINTL

DEFINING GOOD REQUIREMENTS

DECOMPOSE

        WHAT ARE MY AIMS?
        WHAT ARE SOME MEASURABLE GOALS?
        WHAT OBJECTIVES MUST BE MET ALONG THE WAY TO THE GOALS?
        WHAT EXISTS?
        WHAT'S MISSING?

IDENTIFY LIMITING FACTORS

        COST
        TECHNOLOGY
        INSTITUTIONAL
        PERSONNEL

STATINTL

PREPARING A CONTRACT

EVALUATE TECHNICAL RISK
FORMULATE FEE-BASIS RECOMMENDATION
ESTABLISH FEE SCHEDULE
DEFINE DELIVERABLES AND SCHEDULE
ESTABLISH REPORTING AND DOCUMENTATION REQUIREMENTS
COORDINATE WITH SECURITY, LOGISTICS, TRAINING, & FINANCE

STATINTL

QUALIFYING POTENTIAL CONTRACTORS

INDUSTRY CONTACTS & PROFESSIONAL SOCIETIES
QUALIFICATION BRIEFINGS
BIDDERS CONFERENCE
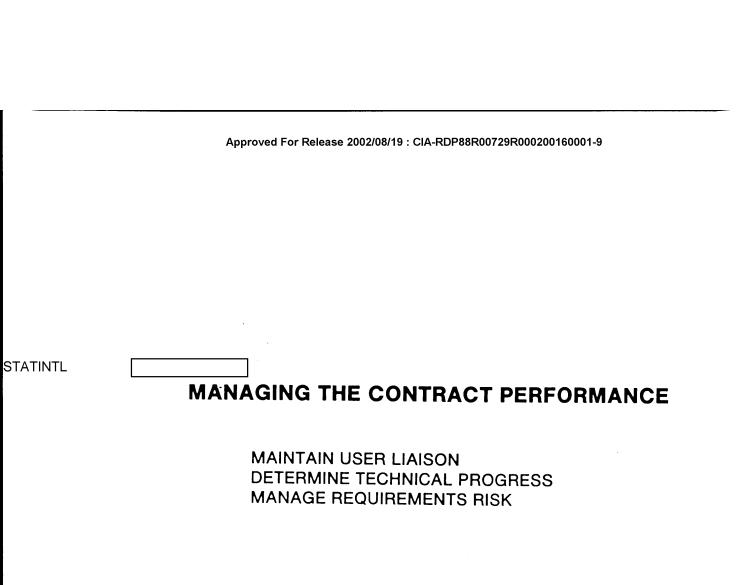
STATINTL

CHOOSING A CONTRACTOR

CONSULTANTS
STUDIES & ANALYSIS
SPECIALTY DEVELOPMENTS
SYSTEMS

STATINTL

MANAGING THE CONTRACT PERFORMANCE

MAINTAIN USER LIAISON
DETERMINE TECHNICAL PROGRESS
MANAGE REQUIREMENTS RISK

STATINTL

CONTROLLING COST & SCHEDULE

ACTIVELY MANAGE CRITICAL PATH ELEMENTS
MINIMIZE WASTED EFFORT
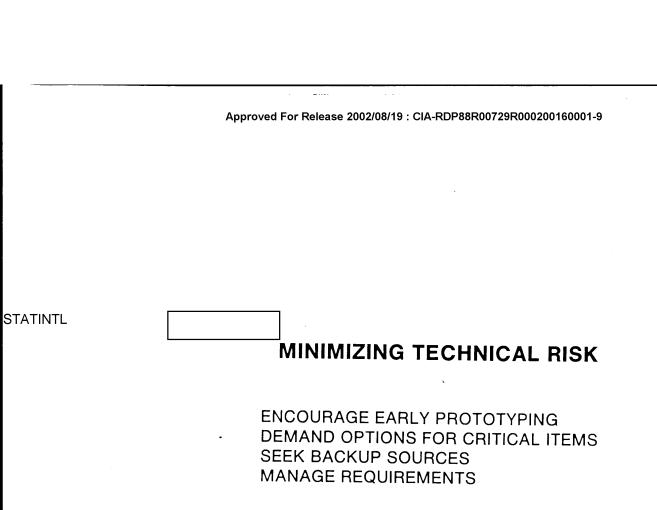ASSURE CLOSURE OF INTERFACES
CONFIRMING ACTUAL PROGRESS

STATINTL

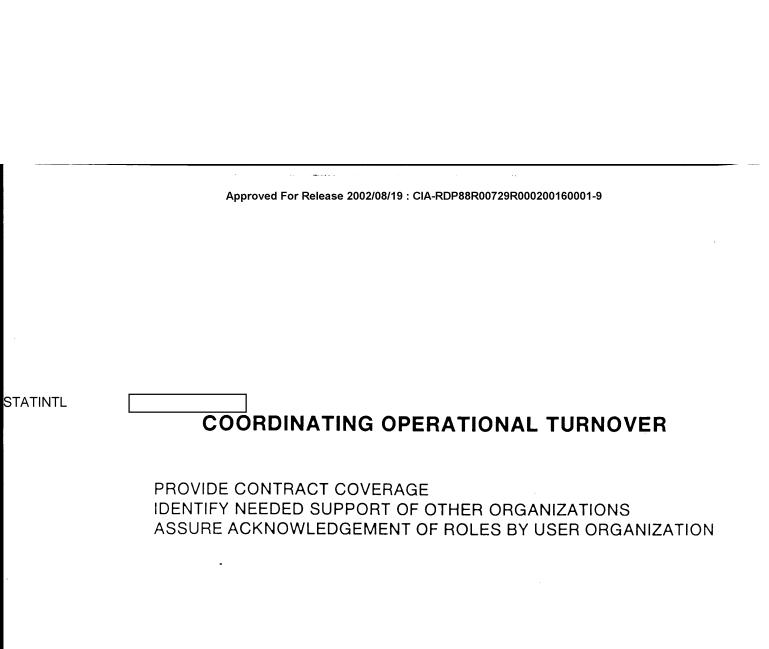# ADMINISTERING COMPLIANCE

SECURITY

GOVT. PROPERTY
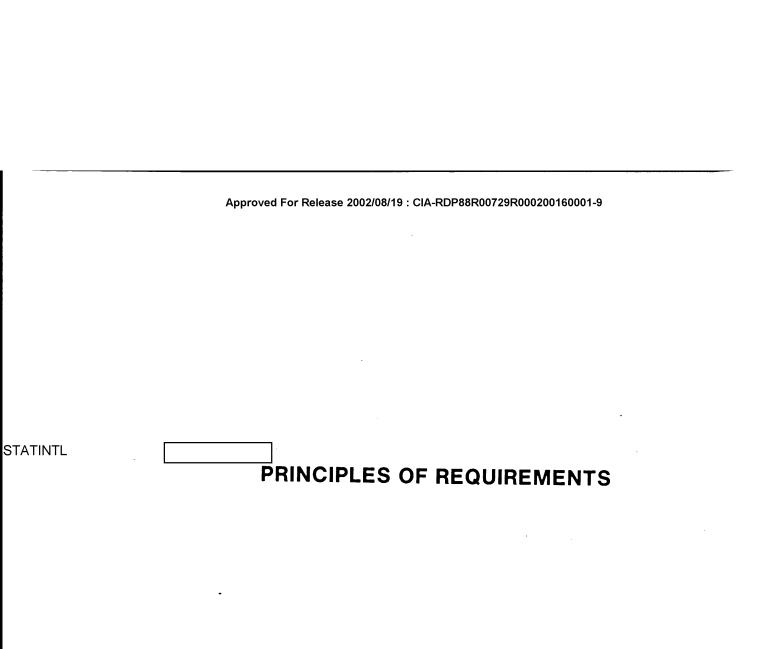
REPORTING

STATINTL

MINIMIZING TECHNICAL RISK

ENCOURAGE EARLY PROTOTYPING
DEMAND OPTIONS FOR CRITICAL ITEMS
SEEK BACKUP SOURCES
MANAGE REQUIREMENTS

STATINTL

ACCEPTING THE END PRODUCT

AGREE TO TEST PLAN
COORDINATE USER INVOLVEMENT
REVIEW TEST RESULTS
AUDIT DELIVERIES

STATINTL

COORDINATING OPERATIONAL TURNOVER

PROVIDE CONTRACT COVERAGE
IDENTIFY NEEDED SUPPORT OF OTHER ORGANIZATIONS
ASSURE ACKNOWLEDGEMENT OF ROLES BY USER ORGANIZATION

STATINTL

PRINCIPLES OF REQUIREMENTS

WHAT CONSTITUTES A REQUIREMENT?

CAPABILITIES

FUNCTIONALITY
MEASURABLE PERFORMANCE
BOUNDARY CONDITIONS

PROBLEM RESOLUTION

THREATS
DISRUPTION
DISFUNCTION
OPERATING COSTS

COST CAP

DEVELOPMENT
OPERATING
ANNUAL

OPERATIONAL DATE

INITIAL CAPABILITY
COMPLETE CAPABILITY

STATINTL

PROPERTIES OF REQUIREMENTS

COMPLETE

    SCOPE OF NEED
    LIFE CYCLE SUPPORT
    PERFORMANCE

CLEAR

    TERMS DEFINED
    SIMPLE STATEMENTS

UNAMBIGUOUS

    SIMPLE CONDITIONS
    SPECIFIC

TESTABLE

    EXPLICIT
    STIPULATED ENVIRONMENT
    KNOWN INTERFACES
    PREDICTABLE BEHAVIOR
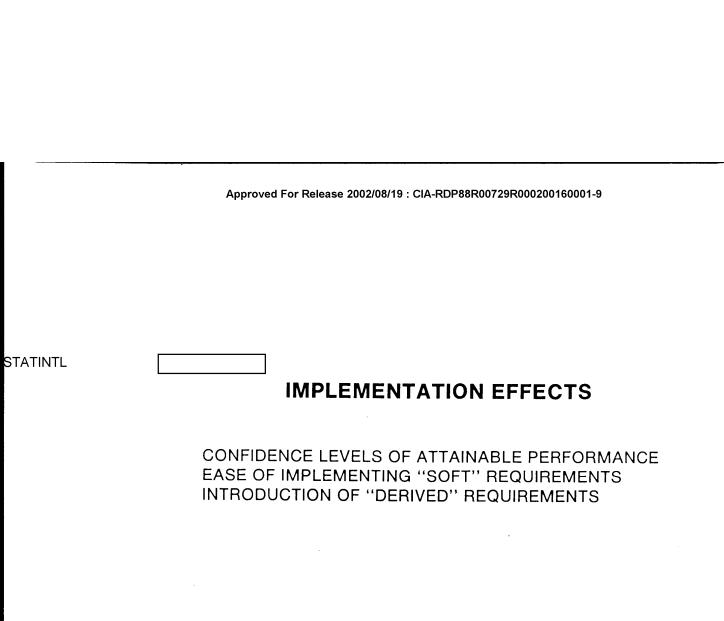
STATINTL

REQUIREMENTS vs SPECIFICATIONS

REQUIREMENT

    PROVIDE STANDARD ARITHMETIC OPERATIONS
    FOR AT LEAST TWO YEARS
    IN A SHIRT-POCKET SIZE
    TO 8 DIGIT ACCURACY

SPECIFICATION

    PERFORM ADDITION, SUBTRACTION, MULTIPLICATION & DIVISION
    MTBF = 3 YRS EXCEPT POWER; FIELD REPLACEABLE BATTERIES,
    MTTR = 20 MIN
    3 x 5 x 1/4 in. PACKAGE
    10 PLACE FIXED POINT DISPLAY, 12 DIGIT INTERNAL ACCURACY

STATINTL

IMPLEMENTATION EFFECTS

CONFIDENCE LEVELS OF ATTAINABLE PERFORMANCE
EASE OF IMPLEMENTING "SOFT" REQUIREMENTS
INTRODUCTION OF "DERIVED" REQUIREMENTS

STATINTL

DISCIPLINES USED TO DEVELOP REQUIREMENTS

INQUIRY

> DESCRIPTION OF OPERATIONAL PROBLEM
> DEFINITION OF TERMS
> FACT FINDING OF USER NEEDS

ANALYSIS

> SIMULATION
> SENSITIVITY ANALYSES
> PERFORMANCE LIMITS

TRADE-OFF STUDIES

> COST-PERFORMANCE TRADES
> CAPABILITY vs DEVELOPMENT TIME
> RISK vs MERITS

STATINTL

DEFINING GOOD REQUIREMENTS (continued)

DECOMPOSE

WHAT ARE MY AIMS?
WHAT ARE SOME MEASURABLE GOALS?
WHAT OBJECTIVES MUST BE MET ALONG THE WAY TO THE GOALS?
WHAT EXISTS?
WHAT'S MISSING?

IDENTIFY LIMITING FACTORS

COST
TECHNOLOGY
INSTITUTIONAL
PERSONNEL

STATINTL

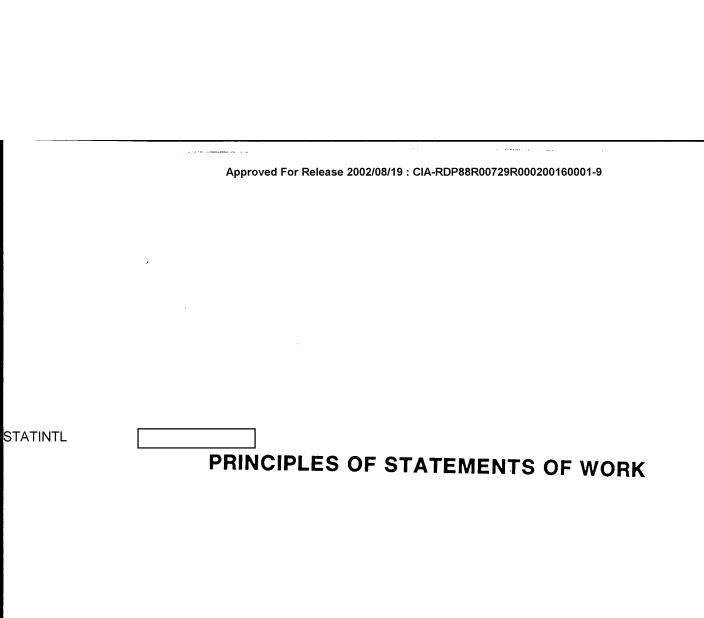# DEFINING GOOD REQUIREMENTS (continued)
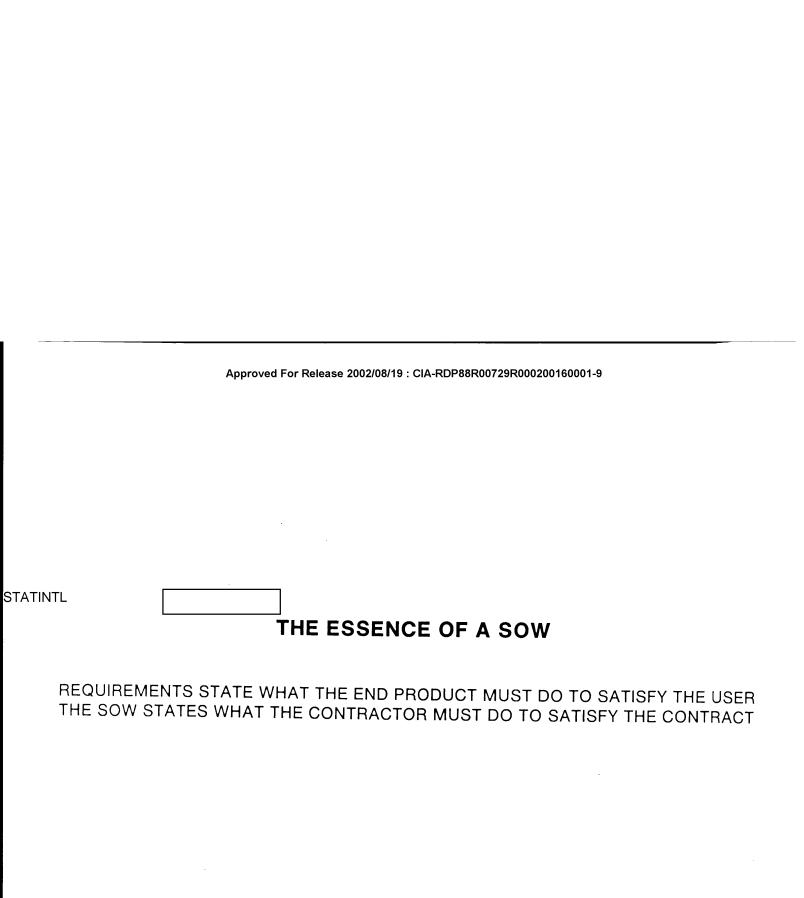
DEFINE THE RULES

    LEGAL
    POLICY
    TRADITION

ADOPT DIFFERENT VIEWPOINTS

    USERS
    BUILDERS
    FUNDERS

CONSIDER THE CONSEQUENCES?

    IMMEDIATE
    NEAR TERM
    FAR TERM

STATINTL

PRINCIPLES OF STATEMENTS OF WORK

STATINTL

THE ESSENCE OF A SOW

REQUIREMENTS STATE WHAT THE END PRODUCT MUST DO TO SATISFY THE USER
THE SOW STATES WHAT THE CONTRACTOR MUST DO TO SATISFY THE CONTRACT

STATINTL

PRODUCT ORIENTED SOW

THE PRODUCT MUST:

MOVE
SENSE
COMPUTE
PROTECT
FUNCTION RELIABLY
BE COMPATIBLE WITH A DEFINED OPERATIONAL ENVIRONMENT

STATINTL

PRODUCT ORIENTED SOW

THE PRODUCT MUST:

MOVE
SENSE
COMPUTE
PROTECT
FUNCTION RELIABLY
BE COMPATIBLE WITH A DEFINED OPERATIONAL ENVIRONMENT

STATINTL

PRODUCT ORIENTED SOW (continued)

THE CONTRACTOR MUST:

DERIVE SPECIFICATIONS
DOCUMENT DEVELOPMENT REQUIREMENTS
DESIGN THE PRODUCT
PRODUCE AND MAINTAIN DRAWINGS & PRODUCT SPECS
HOLD DESIGN REVIEWS
PROVIDE A PRODUCTION FACILITY
BUILD THE PRODUCT
MAINTAIN QUALITY CONTROL
MAINTAIN CONFIGURATION CONTROL
TEST THE PRODUCT
PRODUCE USER AND MAINTENANCE MANUALS
PROVIDE TRAINING
DELIVER AND INSTALL THE PRODUCT
PRODUCE PERIODIC COST AND TECHNICAL PROGRESS REPORTS

STATINTL

R&D ORIENTED SOW

THE PRODUCT MUST:

>DEFINE LIMITS
>ESTABLISH COST-PERFORMANCE OPTIONS
>ESTABLISH FEASIBILITY

THE CONTRACTOR MUST:

>PERFORM ANALYSES
>CONSTRUCT A WORKING MODEL
>CONDUCT EXPERIMENTS
>DOCUMENT RESULTS
>PROJECT FUTURE PERFORMANCE
>CONDUCT BRIEFINGS

STUDY ORIENTED SOW

THE PRODUCT MUST:

    ILLUMINATE A PROBLEM
    DEFINE AND EVALUATE OPTIONS
    ANALYTICALLY ESTABLISH BEHAVIOR

THE CONTRACTOR MUST:

    OBTAIN DATA
    DEVELOP MODELS
    CONDUCT ANALYSES
    EVALUATE RESULTS
    HOLD MEETINGS
    DOCUMENT RESULTS
    CONDUCT A MID-TERM & FINAL BRIEFING

STATINTL

THE COST CONNECTION OF THE SOW

PRODUCT COSTS:

    FUNCTION
    PERFORMANCE
    QUANTITY
    QUALITY

PROCESS COSTS:

    TASKS

        DESIGN
        TEST
        TRAINING

    DOCUMENTATION

        SPECS
        DRAWINGS
        PLANS & PROCEDURES
        FIN.`NCIAL REPORTS
        SCHEDULE PROJECTIONS

    EXTERNAL COORDINATION

        USER INTERFACES
        TECHNICAL INTERFACES
        INFORMATIVE BRIEFINGS

STATINTL

THE COST CONNECTION OF THE SOW (continued)

WORK BREAKDOWN STRUCTURE:

PRODUCT CONNECTED TASKS:

PRODUCT SPECS
PRODUCTION
UNIT TEST

PROCESS MANDATED TASKS:

SYSTEMS ENGINEERING
QUALITY CONTROL
SYSTEM TEST
CONFIGURATION MANAGEMENT
FINANCIAL & SCHEDULE CONTROLS

STATINTL

SOW CHECKLIST

DEFINES ONLY THAT WHICH IS NECESSARY FOR THIS CONTRACT

    GENERAL INFORMATION IS SEPARATED FROM DIRECTION
    CONTRACTOR OBLIGATIONS ARE CLEAR AND DIRECT
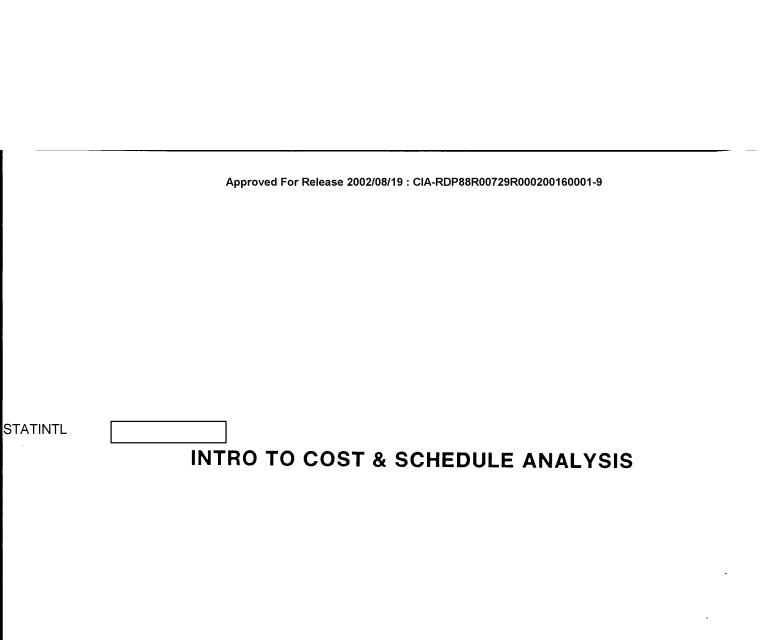   ELIMINATES EXTRANEOUS DATA REQUIREMENTS

TELLS THE CONTRACTOR WHAT HE MUST DO, NOT HOW TO DO IT

    SUFFICIENTLY SPECIFIC TO ALLOW RESOURCES TO BE LISTED
    STIPULATES DELIVERABLES, QUANTITIES & DATES

REFLECTS THE MANAGEMENT CONCEPT FOR EXECUTION OF THE CONTRACT

    CONSISTENT WITH CONTRACT DATA REQUIREMENTS LIST (CDRL)
    REFERENCED CITATIONS ARE CHECKED FOR PERTINENCE

REQUIRES THE MINIMUM CHANGE TO THE CONTRACTOR's NORMAL PRACTICES

STATINTL

INTRO TO COST & SCHEDULE ANALYSIS

STATINTL

STAGES IN COST & SCHEDULE ANALYSIS

IDENTIFY PRODUCT ELEMENTS
DEFINE TASKS TO PRODUCE EACH
DETERMINE COST ELEMENTS
DERIVE COST ESTIMATION RELATIONSHIPS
DETERMINE SCHEDULE CONNECTIONS & CONSTRAINTS
MINIMIZE COST-RISK TRADE-OFF

STATINTL

COST ELEMENTS

DIRECT COSTS

LABOR
EQUIPMENT
MATERIALS
PURCHASED ITEMS
TRAVEL
SHIPPING

STATINTL

COST ELEMENTS (continued)
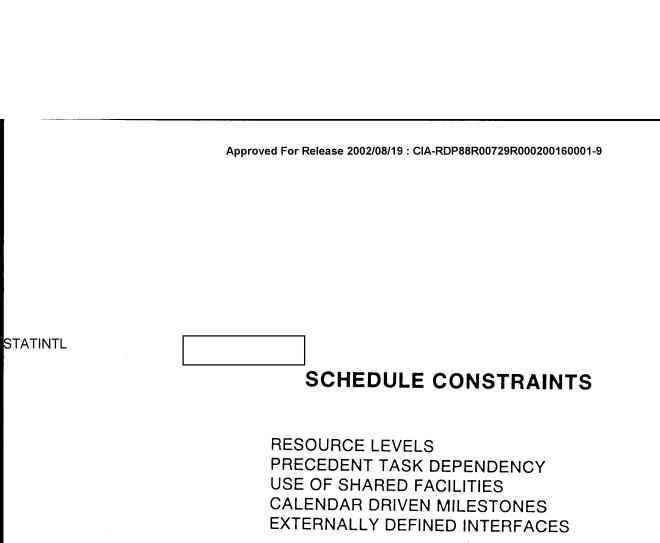
INDIRECT COSTS

        HOLIDAYS & VACATION PAY
        INSURANCE
        UTILITIES
        SECURITY
        PAYROLL & ACCOUNTING
        GENERAL PURPOSE RESEARCH FACILITIES
        BID & PROPOSAL BUDGETS
        INDEPENDENT RESEARCH & DEVELOPMENT

FEE

        EARNED VALUE
        DELIVERED PRODUCTS

STATINTL

TASK DEFINITIONS

KEYED TO END PRODUCTS & DELIVERABLES
SUPPORT INTERNAL MILESTONES
HIERARCHICAL WORK STRUCTURE TO MEET MILESTONES
DEFINES A WINDOW INTO THE SMALLEST UNIT OF PRODUCTION

STATINTL

SCHEDULE CONSTRAINTS

RESOURCE LEVELS
PRECEDENT TASK DEPENDENCY
USE OF SHARED FACILITIES
CALENDAR DRIVEN MILESTONES
EXTERNALLY DEFINED INTERFACES

STATINTL

SCHEDULING CONCEPTS

MINIMUM TIME PATH
MINIMUM COST PATH
MAXIMUM (MINIMUM SLACK) PATH
LOAD LEVELING
EARLIEST vs LATEST START DATE

STATINTL

SCHEDULING ALGORITHMS

FORWARD SCHEDULING

    RESOURCE AVAILABILITY
    TASK DEPENDENCIES
    LOAD LEVELING

BACKWARD SCHEDULING

    NEED DATES
    SLACK MANAGEMENT

COST-SCHEDULE TRADES

OVERTIME PAY
OVERHEAD STRETCH-OUT
LEARNING CURVE EFFECTS
PRODUCTION LINE LIMITS
FIXED FACILITY CHOKEPOINTS
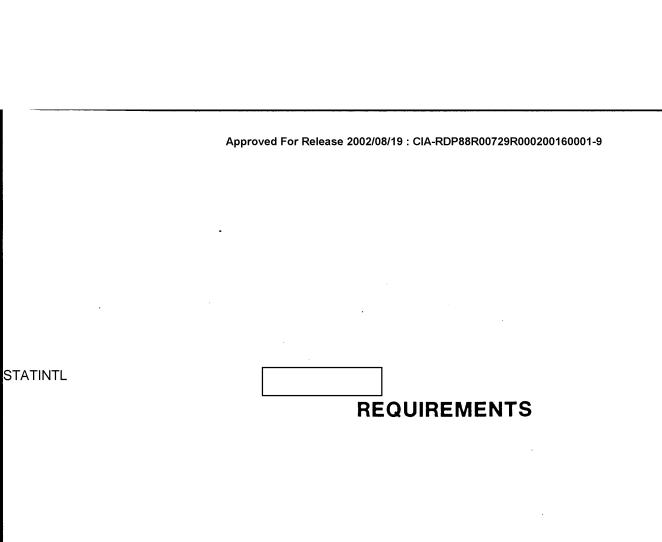
STATINTL

LIFECYCLE FACTORS

MAINTENANCE
SUPPLIES
RECURRING TRAINING
OPERATIONAL MODIFICATIONS

STATINTL

REQUIREMENTS

EVOLVING DETAIL

NEEDS (USER/systems engineer)

    IDEAL GOALS
    MISSION ORIENTED
    TEST: MUST MAKE OPERATIONAL SENSE

REQUIREMENTS (USER/SYSTEMS ENGINEER)

    PERFORMANCE GOALS
    MIX OF MISSION, ARCHITECTURE, AND FUNCTION
    TEST: MUST BE FEASIBLE

SPECIFICATIONS (user/SYSTEMS ENGINEER)

    MEASURABLE PROPERTIES
    EQUIPMENT & FUNCTIONS
    TEST: MUST BE PROVABLE

STATINTL

INTERFACE SPECIFICATIONS

HARDWARE

        PACKAGING CONSTRAINTS
        PHYSICAL INTERFACES
        ELECTRICAL INTERFACES
        COMPUTERS
        CONSTRAINTS OR LIMITATIONS

SOFTWARE

        OPERATING SYSTEM
        UTILITY PROGRAMS
        OTHER APPLICATION PROGRAMS
        CONSTRAINTS OR LIMITATIONS

STATINTL

INTERFACE SPECIFICATIONS (continued)

COMMUNICATIONS

      PROTOCOLS
      PRIORITIES
      TRAFFIC VOLUME
      TIMELINESS

DATA

      INPUT/OUTPUT INFORMATION
      QUANTITY
      TIMING

OPERATIONS

      ORGANIZATIONAL ROLES
      PROCEDURES
      INTERACTIONS

STATINTL

DATA PROCESSING SYSTEMS

- FUNCTIONS AND OPERATING MODES
  INITIALIZATION
  WORKLOAD THROUGHPUT & PEAKS
  DATA CHARACTERISTICS & VOLUME
  STIMULI AND RESPONSES
  STORAGE/RETRIEVAL VOLUMES & TIMELINES
  ACCURACY
  INPUT/OUTPUT OPTIONS AND LOADS
  DECISION AND CONTROL OPTIONS
  ERROR DETECTION & RECOVERY
  HUMAN FACTORS
  DESIGN MARGINS
  AVAILABILITY

STATINTL

SENSOR SYSTEMS

SIGNATURE ENVIRONMENT
BACKGROUND ENVIRONMENT
DETECTION VOLUME
PROBABILITY OF DETECTION
FALSE ALARM RATE
FAILURE DETECTION & RECOVERY
BUILT-IN TEST
AVAILABILITY
OPERATING LIFE
PACKAGING LIMITS
SUPPORT LIMITS (POWER, TEMP CONTROL,
ETC)

MECHANICAL SYSTEMS

EXTERNAL LOADS
FUNCTIONS
ACCURACY/TOLERANCES
SAFETY
WEAR LIMITS
MOTION CONSTRAINTS
OPERATING ENVIRONMENTS
OPERATING LIFE
AVAILABILITY
MEAN-TIME-BEFORE-FAILURE & MEAN-TIME-TO-REPAIR

STATINTL

NEGATIVE REQUIREMENTS

IF I ONLY STATE THAT WHICH I WANT
· AND NEVER SAY WHAT I WANT NOT
THEN I CAN'T COMPLAIN WHEN I FINALLY LEARN
THAT TOO MUCH ....NOT....
............IS ALL I GOT!

STATINTL

PERFORMANCE vs "...ILITIES"

ENVIRONMENTAL DESCRIPTION

BACKGROUND ENVIRONMENT
EXTERNAL LOADS
OPERATING ENVIRONMENTS

PERFORMANCE

MISSION UTILITY
ERROR ANALYSIS
ACCURACY/TOLERANCES

STATINTL

VARYING LEVELS OF PRESUMED THREAT LEVELS

TIMELINESS

    SYSTEM SIMULATION UNDER LOAD
    MAN/MACHINE TRADE-OFFS
    COST/COMPUTER POWER TRADE-OFFS
    REACTION TIME

ROBUSTNESS

    PHYSICAL SURVIVABILITY
    ADAPTABILITY
    TRANSPORTABILITY
    CONTROL OPTIONS

ACTIVITY LEVELS

    MISSION AND OPERATIONS ANALYSES
    ENVIRONMENTAL DESCRIPTION

MANNED vs UNMANNED SYSTEMS

DECISION ANALYSIS

    DECISION SEQUENCES
    INFORMATION REQUIREMENTS
    ERROR EFFECTS

WORK LOAD ANALYSIS

    CONTENT
    LEVEL
    INTERFACES

HUMAN FACTORS STUDIES

    PHYSICAL RESPONSE
    STRESS RESPONSE
    TRAINING

SAFETY

STATINTL
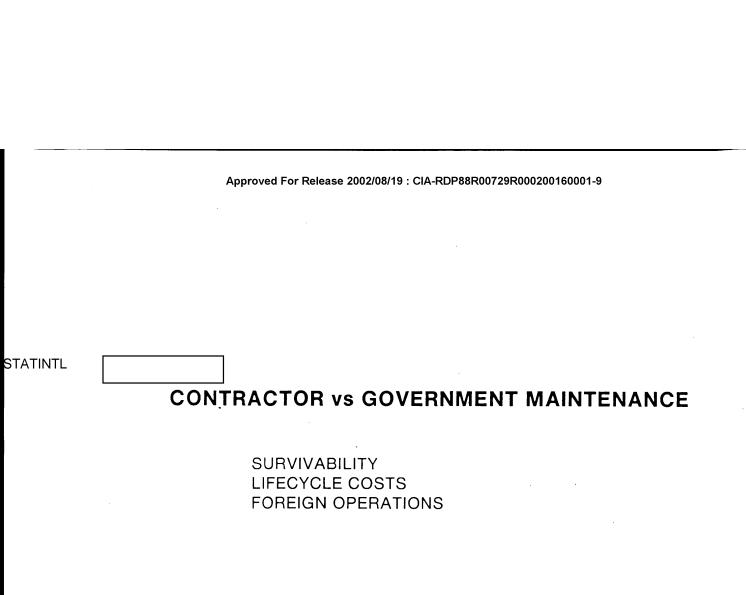
FACTORY vs FIELD CALIBRATION

RELIABILITY
MAINTAINABILITY
ERROR DETECTION & RECOVERY
SURVIVABILITY

STATINTL

CONTRACTOR vs GOVERNMENT MAINTENANCE

SURVIVABILITY
LIFECYCLE COSTS
FOREIGN OPERATIONS
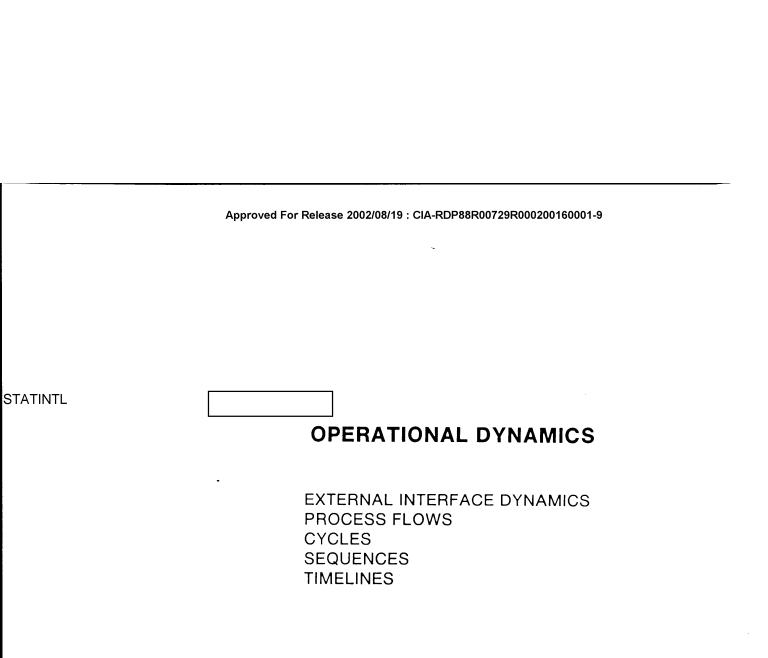
STATINTL

SCOPE OF DEFINITION

Transition from Current Operations

Operational Organizational Roles

Support Organization Roles

Training

Maintenance

End-of-Life Disposal

STATINTL

OPERATIONAL DYNAMICS

EXTERNAL INTERFACE DYNAMICS
PROCESS FLOWS
CYCLES
SEQUENCES
TIMELINES
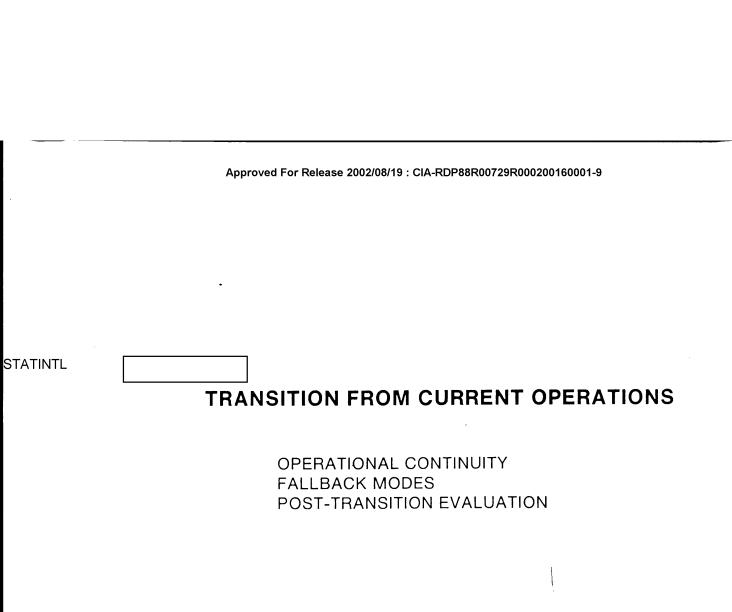
STATINTL

OPERATIONAL THEMES

DATA ENVIRONMENT
THREAT ENVIRONMENTS
LOGISTIC ENVIRONMENTS
PERSONNEL
CONTROL CRITERIA
PERFORMANCE LEVELS

STATINTL

TRANSITION FROM CURRENT OPERATIONS

OPERATIONAL CONTINUITY
FALLBACK MODES
POST-TRANSITION EVALUATION

STATINTL

USERS ("BENEFACTOR")

ROLES

      DEFINE PROBLEMS
      DEVELOP STRATEGY
      STRUCTURE APPROACH
      MAKE DECISIONS
      EVALUATE RESULTS

CONSTRAINTS ON THE ROLE

      SPAN OF CONTROL IN OPERATIONS
      UNDERSTANDING OF THE SYSTEM
      INFORMATION SOURCES & CONTENT

REQUIREMENTS IMPACT

      PERFORMANCE ASSESSMENT
      OPERATIONAL FLEXIBILITY
      USER-ORIENTED TRAINING

OPERATORS ("PHYSICAL USER")

ROLES
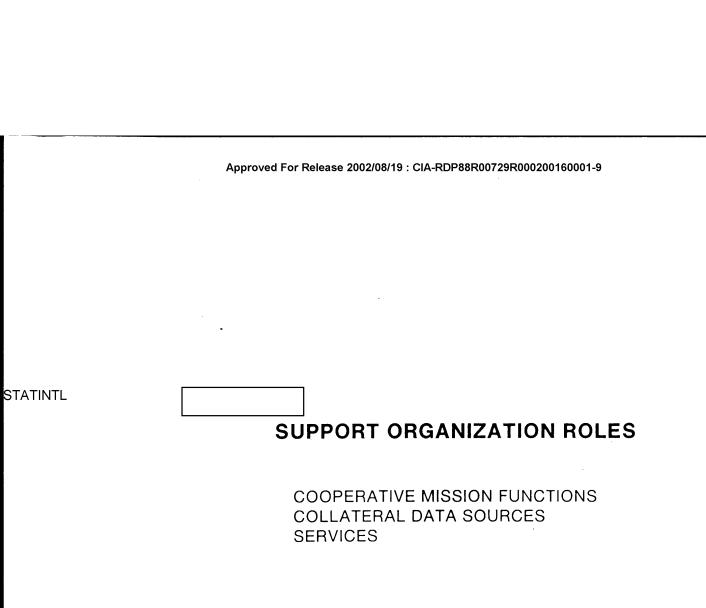
       ENTER DATA
       CALIBRATE EQUIPMENT
       PERFORM TEST PROCEDURES
       MANIPULATE DEVICES
       VALIDATE RESULTS
       RESPOND TO ERRORS

CONSTRAINTS ON THE ROLE

       EXPERIENCE
       EDUCATION LEVEL
       PHYSICAL CAPABILITIES
       OPERATING ENVIRONMENT

REQUIREMENTS IMPACT

       DECISION OR REACTION TIME
       ERROR EFFECTS ON MISSION
       SAFETY & SECURITY RISKS
       TRAINING TIME & COSTS

STATINTL

SUPPORT ORGANIZATION ROLES

COOPERATIVE MISSION FUNCTIONS
COLLATERAL DATA SOURCES
SERVICES

STATINTL

TRAINING

MODES

    INITIAL
    RECURRING
    QUICK REACTION

AUDIENCES

    USERS
    OPERATORS
    MAINTENANCE
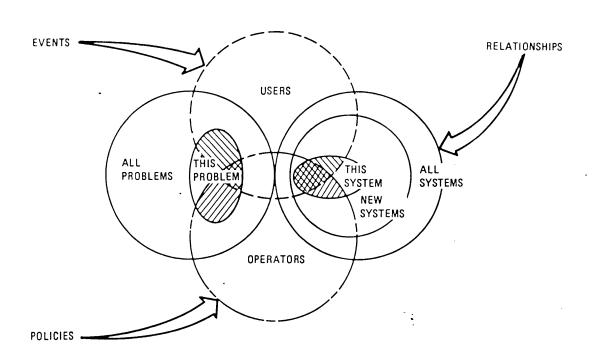
STATINTL

MAINTENANCE
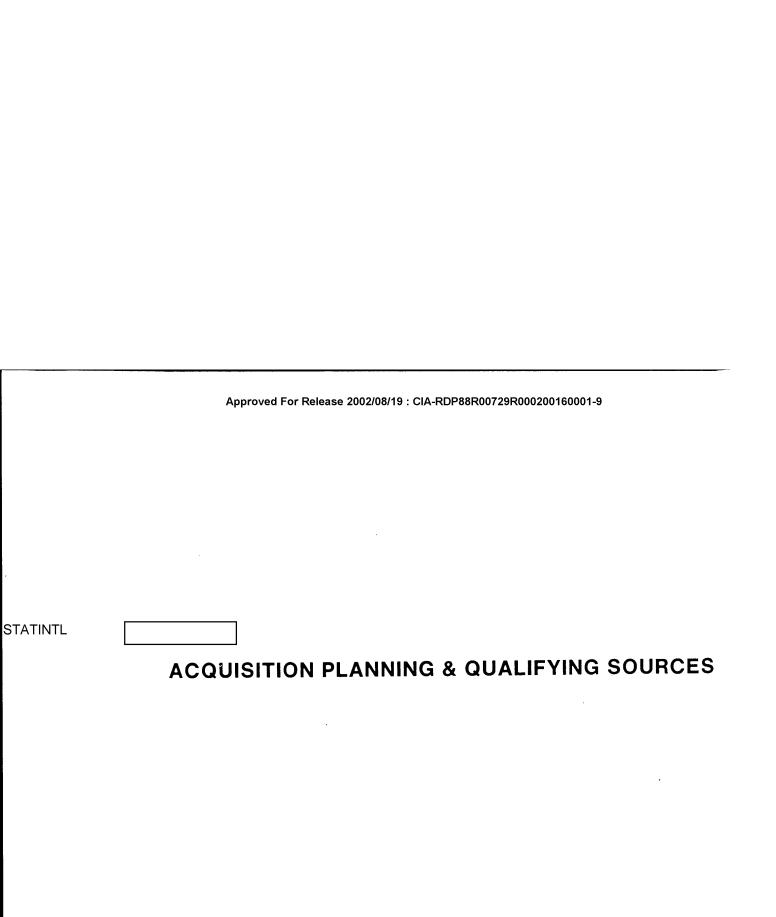
PREVENTATIVE
ON-DEMAND
REPLACEMENT PARTS
CONSUMABLE SUPPLIES

The Operational Environment

EVENTS

RELATIONSHIPS

USERS

ALL
PROBLEMS

THIS
PROBLEM

THIS
SYSTEM

ALL
SYSTEMS

NEW
SYSTEMS

OPERATORS

POLICIES

STATINTL

ACQUISITION PLANNING & QUALIFYING SOURCES
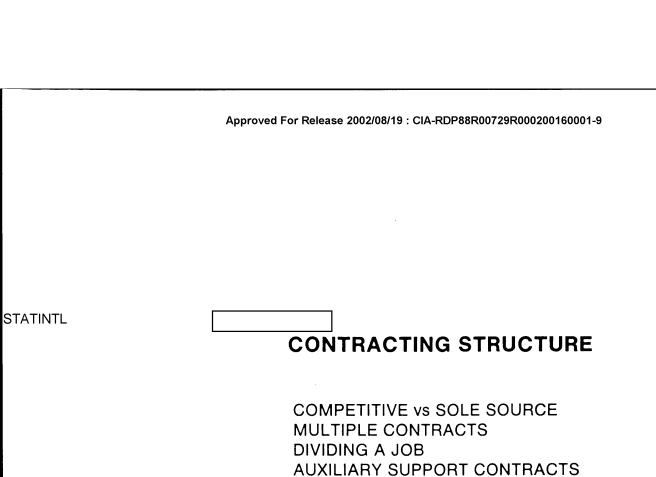
ACQUISITION PARAMETERS AND THEIR INFLUENCE

SIZE

NUMBER OF CONTRACTS
MANAGEMENT STRUCTURE

RISK

SCHEDULE
BUDGET
TYPE OF CONTRACT

STATINTL

CONTRACTING STRUCTURE

COMPETITIVE vs SOLE SOURCE
MULTIPLE CONTRACTS
DIVIDING A JOB
AUXILIARY SUPPORT CONTRACTS
    SYSTEM INTEGRATION
    INDEPENDENT TEST

STATINTL
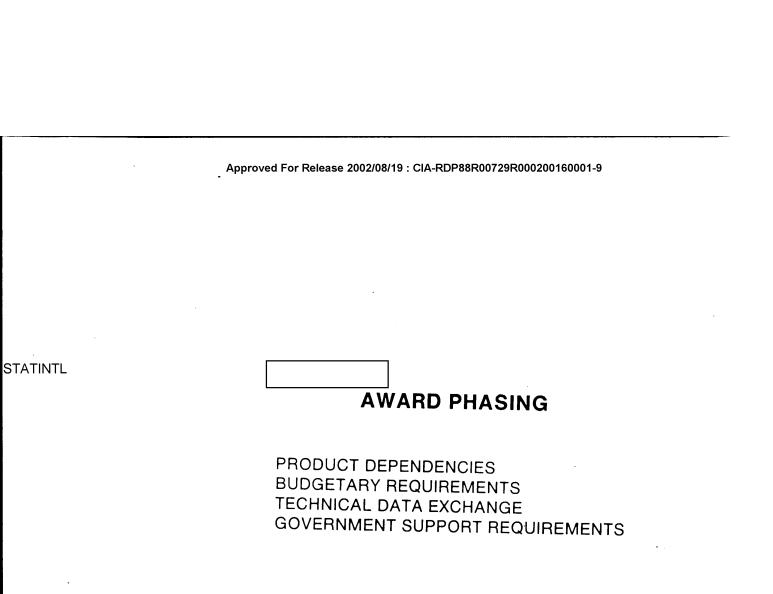
CONTRACTUAL PACKAGING
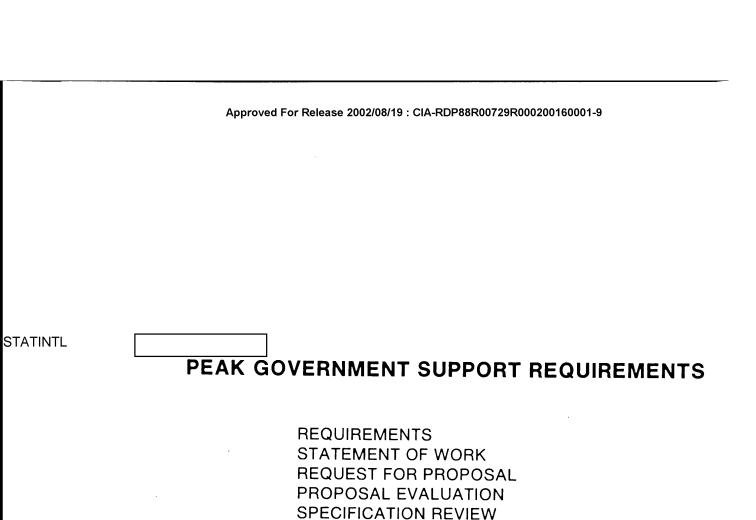
DESIGN FACTORS

    INTERFACE SIMPLICITY

    TESTABILITY

MANAGEMENT FACTORS

    INDUSTRY SPECIALIZATION

    SCHEDULE

    ACCOUNTABILITY

    INTERDEPENDENCES

    SECURITY

STATINTL

AWARD PHASING

PRODUCT DEPENDENCIES
BUDGETARY REQUIREMENTS
TECHNICAL DATA EXCHANGE
GOVERNMENT SUPPORT REQUIREMENTS

STATINTL

PEAK GOVERNMENT SUPPORT REQUIREMENTS

REQUIREMENTS
STATEMENT OF WORK
REQUEST FOR PROPOSAL
PROPOSAL EVALUATION
SPECIFICATION REVIEW
DESIGN REVIEW
TESTING

STATINTL

PROCUREMENT

Market Survey

Request for Proposals

Proposal Evaluation

Contracting

MARKET SURVEYS

Critical Skills

Security & Foreign Ownership/Control

Financial Stability

Specialized Facilities

Manpower

Past Performance (CONIF)

STATINTL

REQUEST FOR PROPOSALS

STATEMENT OF WORK

TASKS
DELIVERABLES
SCHEDULE
SYSTEM DESCRIPTION

PRODUCT REQUIREMENTS
CONTRACT DOCUMENT APPROVAL
DATA REQUIREMENTS DOCUMENT
WORK BREAKDOWN STRUCTURE
INCENTIVE OPTIONS
PROPOSAL ORGANIZATION REQUIREMENTS
PROPOSAL EVALUATION GUIDES

STATINTL

TECHNICAL PROPOSAL CONTENTS

DESIGN CONCEPT

       HARDWARE
       SOFTWARE
       DATA
       OPERATIONAL PROCEDURES
       TRAINING
       MAINTENANCE

CRITICAL PROBLEMS

       DIFFICULT REQUIREMENTS
       IMMATURE TECHNOLOGY
       STRESSFUL ENVIRONMENT
       UNUSUAL LOGISTIC NEEDS
       PACKAGING

STATINTL

TECHNICAL PROPOSAL CONTENTS (continued)

TRADE-OFF OPPORTUNITIES

      CONFLICTING REQUIREMENTS
      COST-EFFECTIVE ENHANCEMENTS
      DEVELOPMENT COST vs RECURRING COSTS

DEVELOPMENT APPROACH

      PROTOTYPES
      BUILDS
      PHASED DEPLOYMENTS

TEST APPROACH

      TEST PHILOSOPHY
      GOVERNMENT ROLE & DATA
      SIMULATORS
      TEST EQUIPMENT

SCHEDULE
MANNING

STATINTL

MANAGEMENT PROPOSAL CONTENTS

Organization and Personnel

Technical and Financial Controls

Configuration and Data Management

Security Plan

Developement Support

Field Support

Integrated Logistics Support

Documentation Plan

Relevant Experience

Biographical Data

Proposal Linkage

COST PROPOSAL CONTENTS

ESTIMATING BASIS

      TECHNICAL SIZING
      PRODUCTION BASE
      EXISTING FACILITIES, TOOLING, ETC

WORK BREAKDOWN STRUCTURE
RATES

      DIRECT LABOR
      OVERHEAD

RESULTS

      PRODUCT RELATED BREAKOUT
      FISCAL YEAR SPREAD
      REQUIREMENTS BREAKOUT

EFFECTS OF UNCERTAINTIES

STATINTL

PROPOSAL EVALUATION GUIDES

FORCE EARLY RECOGNITION OF CRITICAL ISSUES
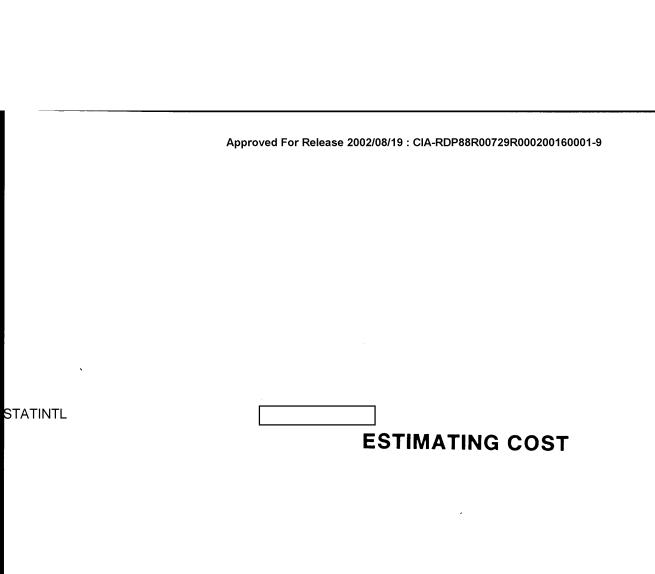
    KEY DESIGN TRADE-OFFS
    STATE-OF-ART UNCERTAINTIES
    RAPID MANNING REQUIRED
    FAMILY SEPARATIONS
    UNCONTROLLED INTERFACES

STIMULATE THE DESIRED BALANCE

    TECHNICAL/MANAGEMENT/COST
    DESIGN/TEST/OPERATIONS
    ARCHITECTURE-SPECIFIC ELEMENTS

PROMOTE COMPETITION

    ENCOURAGE RESPONSES
    INCREASE ACCEPTABLE RESPONSES
    IMPROVE CONTRACTOR'S UNDERSTANDING OF PRIORITIES

STATINTL

ESTIMATING COST
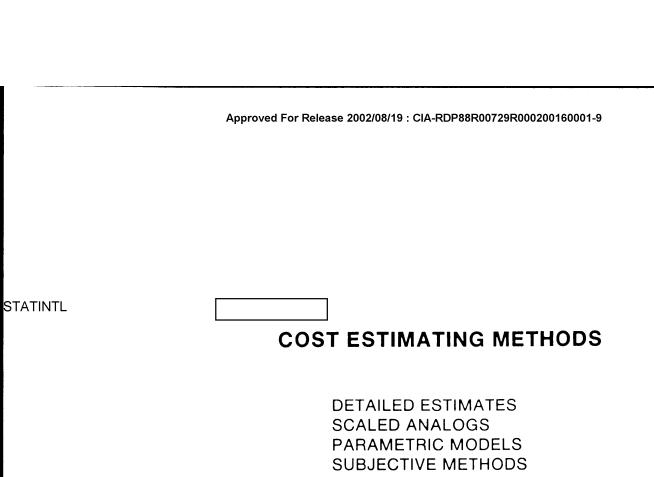
STATINTL

COST ESTIMATION

TOTAL EFFORT

       PROJECT SCALE
       COMPLEXITY
       AVAILABLE TECHNOLOGY
       DELIVERY TIME

LOADING

       CUMULATIVE EFFORT
       STAFF ABSORBTION RATE
       WORK DAY LENGTH

STATINTL

COST ESTIMATING METHODS

DETAILED ESTIMATES
SCALED ANALOGS
PARAMETRIC MODELS
SUBJECTIVE METHODS

STATINTL

DETAILED ESTIMATES

DESCRIPTION

      BASELINE DESCRIPTION OF WORK
      CAPITAL EQUIPMENT & SCHEDULES
      COSTING RATES AND FACTORS
      WORK-BREAKDOWN-STRUCTURE ORIENTED
      "LEARNING CURVES"

PROS/CONS

      HIGHLY VISIBLE
      GAINS COMMITMENT
      COSTLY

STATINTL

SCALED ANALOGS

DESCRIPTION

EXISTING SIMILAR SYSTEM
CAN BE SCALED PHYSICALLY OR
    PROGRAMMATICALLY

PROS/CONS

HIGH CONFIDENCE BASELINE
LIMITED EXTRAPOLATION

STATINTL

PARAMETRIC MODELS

DESCRIPTION

     BASED ON EMPERICAL FIT TO HISTORICAL DATA
     COST ELEMENT ORIENTED
        COMPONENT BREAKDOWN
        TECHNICAL, PHYSICAL OR
          PERFORMANCE CHARACTERISTICS
        PROGRAM TASKS (QUALITY CONTROL,
          DOCUMENTATION, DESIGN)

PROS/CONS

     MODELS PERMIT PARAMETRIC DESIGN
     REPEATABLE
     INTERCONNECTED EFFECTS
     SCHEDULE SENSITIVE
     DATA BASES MUST BE VALIDATED
     MODELS MUST BE CALIBRATED
     EXTRAPOLATION LIMITS SHOULD BE KNOWN

STATINTL

SUBJECTIVE METHODS

DESCRIPTION

      EXPERT OPINION
      DELPHI
      W-A-G

PROS/CONS

      ONLY TECHNIQUE USEFUL FOR NEW TECHNOLOGY
      FAST & CHEAP
      UNBOUNDED ERRORS

STATINTL

ESTABLISHING SCALING FACTORS

EFFECTS OF SIZE
TECHNOLOGY IMPROVEMENTS
PRODUCTION TOOLS

STATINTL

FINDING THE DATA

INDUSTRY MODELS
CONTRACTED STUDIES
GOVERNMENT FILES

STATINTL

LOOKING BEHIND THE DATA
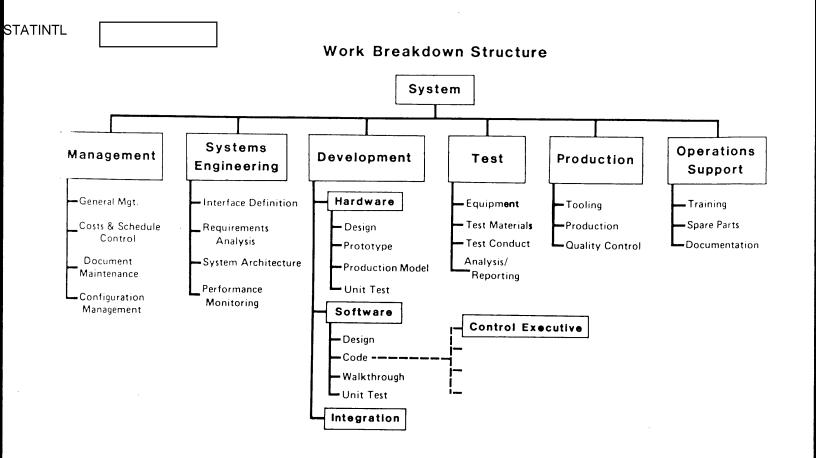
SHARED FACILITIES
GOVERNMENT FURNISHED ITEMS
PRODUCTIVITY OR EXPERIENCE
REQUIREMENTS CHANGES
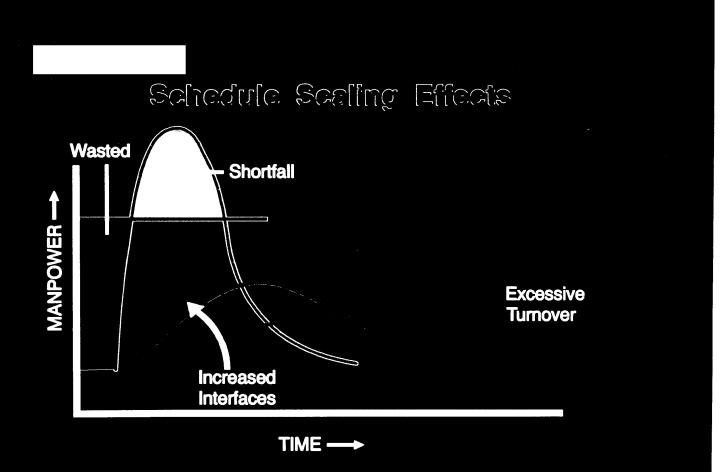
STATINTL

SCHEDULING FACTORS

STAFFING RATE POSSIBLE
LEARNING ACCELERATION FACTOR
INTERFACE COMPLEXITY
RESOURCE BOTTLENECKS
CONTRACT DEPENDENCIES

STATINTL

Work Breakdown Structure

```
                              ┌──────────┐
                              │  System  │
                              └──────────┘
```

Management
- General Mgt.
- Costs & Schedule Control
- Document Maintenance
- Configuration Management

Systems Engineering
- Interface Definition
- Requirements Analysis
- System Architecture
- Performance Monitoring

Development

Hardware
- Design
- Prototype
- Production Model
- Unit Test

Software
- Design
- Code
- Walkthrough
- Unit Test

Integration

Control Executive

Test
- Equipment
- Test Materials
- Test Conduct
- Analysis/ Reporting

Production
- Tooling
- Production
- Quality Control

Operations Support
- Training
- Spare Parts
- Documentation

Schedule Scaling Effects

STATINTL

DEFINES SCOPE OF EFFORT

MANAGEMENT
STUDIES
DEVELOPMENT
TESTING
COORDINATION
INTEGRATION
MEETINGS
TRAINING
REVIEWS
MAINTENANCE
SUPPORT

STATINTL

TASK EXAMPLES

DEVELOP, TEST, AND DELIVER A SYSTEM WHICH MEETS
  REQUIREMENTS SPEC
PROVIDE DOCUMENTATION PER MILSTD 490/483
PERFORM AN ACCURACY/RELIABILITY TRADEOFF STUDY
TRAIN 200 PERSONNEL AT 3 CONUS SITES
SHARE IN DEVELOPMENT OF INTERFACE SPECS
REVIEW & CRITIQUE OTHER CONTRACTOR'S TEST PLANS
PROVIDE A MONTHLY PROGRESS BRIEFING IN WASHINGTON

STATINTL

STIPULATES REQUIRED MANAGEMENT PROCEDURES

CONFIGURATION CONTROL
QUALITY CONTROL
CRITICAL PATH SCHEDULES
WORK BREAKDOWN STRUCTURE
COST REPORTING SYSTEM

STATINTL

IDENTIFIES OTHER APPLICABLE DOCUMENTS

STANDARDS AND PRACTICES
REGULATIONS
LEGALLY REQUIRED PROGRAMS
PRECEDENCE OF REQUIREMENTS
HIGHER LEVEL REQUIREMENT DOCUMENTS
INTERFACE DOCUMENTATION
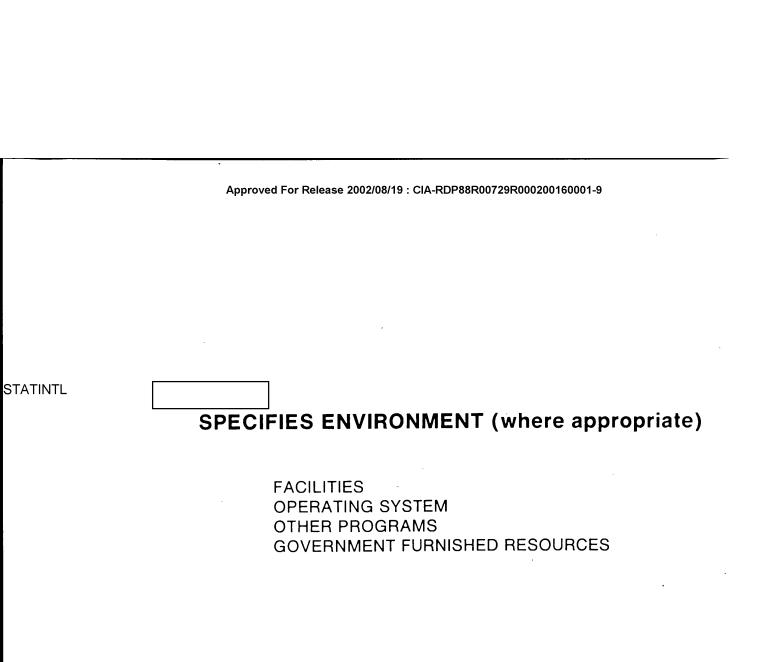
STATINTL

IDENTIFIES DELIVERABLES AND SCHEDULE

DOCUMENTS
BRIEFINGS
DESIGN REVIEWS
STATUS MEETINGS
END PRODUCTS
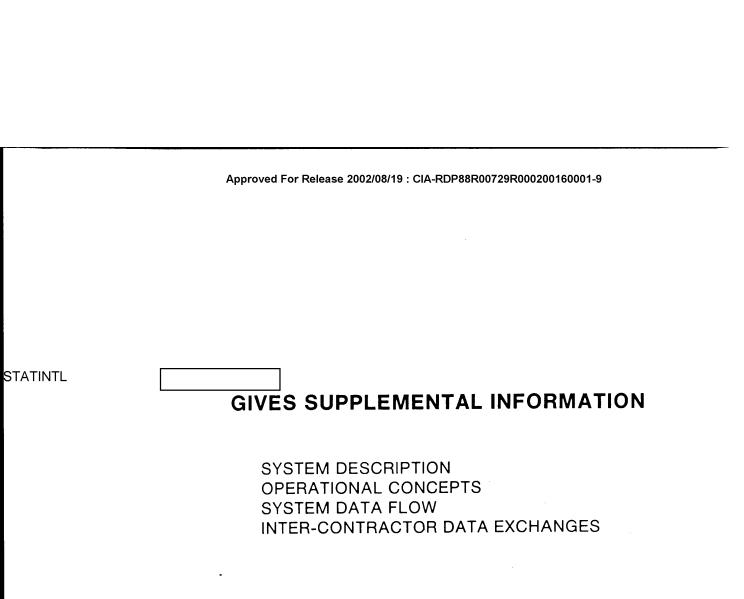
STATINTL

SPECIFIES ENVIRONMENT (where appropriate)

FACILITIES
OPERATING SYSTEM
OTHER PROGRAMS
GOVERNMENT FURNISHED RESOURCES

STATINTL

ESTABLISHES THE NEED FOR MINIMAL STANDARDS
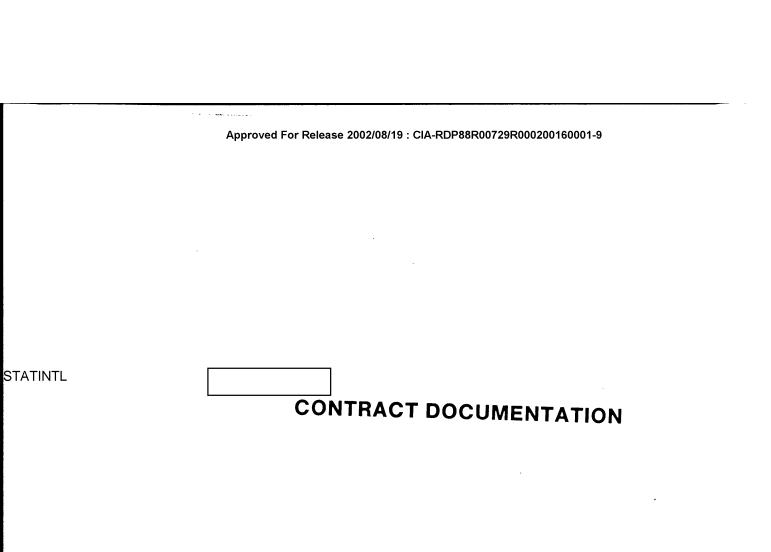
Programming Standards and Conventions

Design Standards

Testing and Quality Assurance

Safety Criteria

Physical & Personnel Security

STATINTL

GIVES SUPPLEMENTAL INFORMATION

SYSTEM DESCRIPTION
OPERATIONAL CONCEPTS
SYSTEM DATA FLOW
INTER-CONTRACTOR DATA EXCHANGES
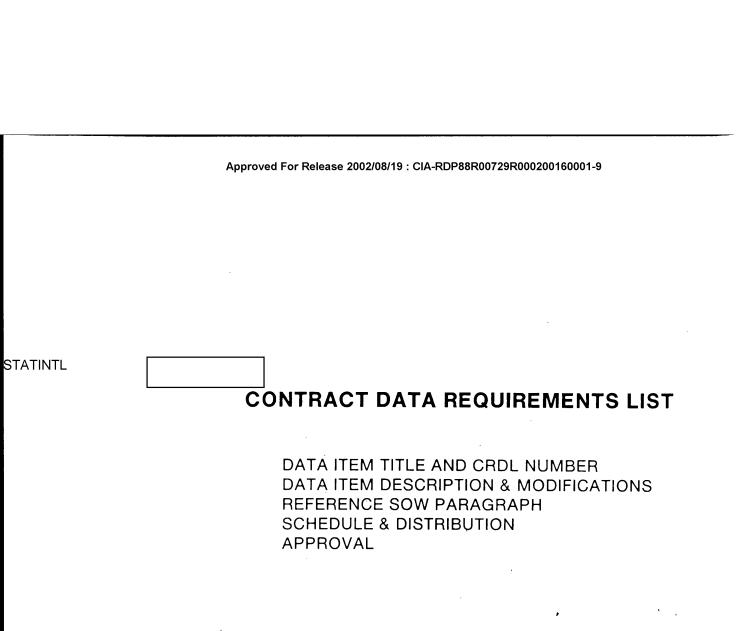
STATINTL

WORK WORD—EXAMPLES

ANALYZE—Solve by analysis
CONSIDER—Think about
DEVELOP—Bring into being
DEFINE—Make clear; Settle the limits
ESTIMATE—Approximate an opinion of
INSTALL—Place; Put into position
INSPECT—Examine carefully or officially
MANUFACTURE—Fabricate from raw materials
ORGANIZE—Integrate; Arrange in a coherent unit
PERFORM—Do; Carry out; Accomplish
RECOMMEND—Advise; Attract favor of
STUDY—Careful examination or analysis

STATINTL

CONTRACT DOCUMENTATION

STATINTL

CONTRACT DATA REQUIREMENTS LIST

DATA ITEM TITLE AND CRDL NUMBER
DATA ITEM DESCRIPTION & MODIFICATIONS
REFERENCE SOW PARAGRAPH
SCHEDULE & DISTRIBUTION
APPROVAL

STATINTL

CONTRACT DOCUMENT APPROVAL

PROVIDES BASELINE FOR DESIGN
ENABLING AUTHORITY FOR INCENTIVE EVENTS
FACILITATES ULTIMATE QUALITY CONTROL

REVIEW CYCLE MUST BE REALISTIC
REVIEWERS MUST BE CRITICAL

PERMITS COORDINATION ACROSS CONTRACT INTERFACES

USER COMMUNITY REVIEW
TECHNICAL INTERFACES

ASSURES THAT CONTRACTOR PRODUCES INTERNALLY
REQUIRED DOCUMENTATION

STATINTL

DOCUMENTATION PURPOSES

STRUCTURE THE IMPLEMENTATION

    ARCHITECTURE
    LOGIC
    DATA STRUCTURE
    USAGE

GUIDE THE DEVELOPMENT PROJECT

    PLANS
    STATUS
    TESTS
    COORDINATION
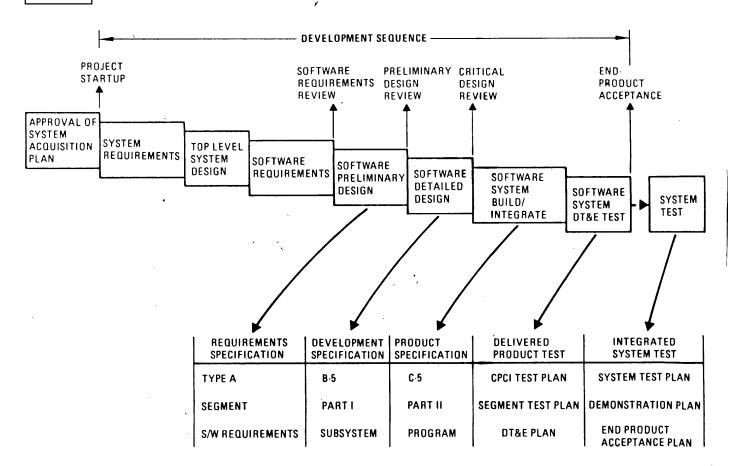
FACILITATE OPERATIONAL USAGE

    INPUTS
    STATUS
    CHANGES
    STUDIES
    TRAINING
    MAINTENANCE
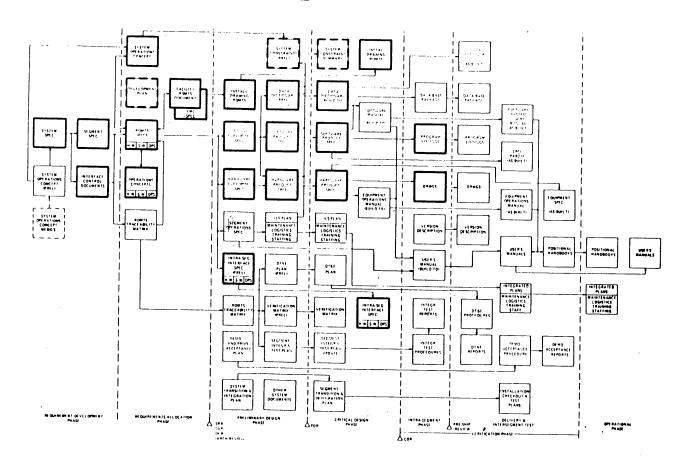
The Software Document Maze

◄──────────────── DEVELOPMENT SEQUENCE ────────────────►

| PROJECT STARTUP | | SOFTWARE REQUIREMENTS REVIEW | PRELIMINARY DESIGN REVIEW | CRITICAL DESIGN REVIEW | END-PRODUCT ACCEPTANCE |

APPROVAL OF SYSTEM ACQUISITION PLAN

SYSTEM REQUIREMENTS

TOP LEVEL SYSTEM DESIGN

SOFTWARE REQUIREMENTS

SOFTWARE PRELIMINARY DESIGN

SOFTWARE DETAILED DESIGN

SOFTWARE SYSTEM BUILD/ INTEGRATE

SOFTWARE SYSTEM DT&E TEST

SYSTEM TEST

REQUIREMENTS SPECIFICATION	DEVELOPMENT SPECIFICATION	PRODUCT SPECIFICATION	DELIVERED PRODUCT TEST	INTEGRATED SYSTEM TEST
TYPE A	B-5	C-5	CPCI TEST PLAN	SYSTEM TEST PLAN
SEGMENT	PART I	PART II	SEGMENT TEST PLAN	DEMONSTRATION PLAN
S/W REQUIREMENTS	SUBSYSTEM	PROGRAM	DT&E PLAN	END PRODUCT ACCEPTANCE PLAN

Development Documents Flow

Verification Documents Flow
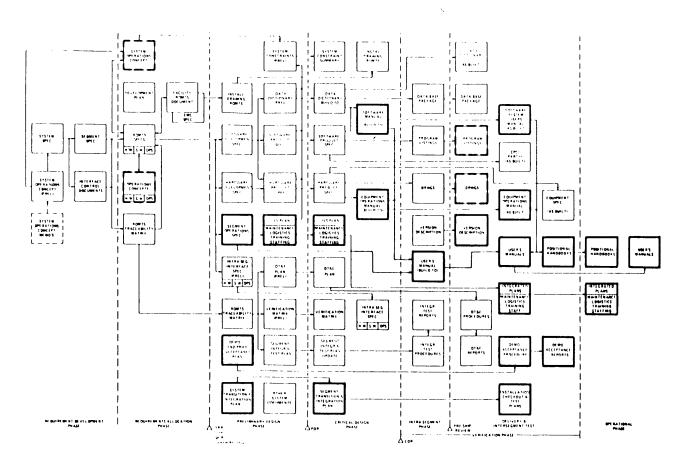
Integration/Operational Documents Flow

STATINTL

PROJECT CONTROL DOCUMENTS

MANAGEMENT PLANS

      ORGANIZATION
      STAFFING
      FINANCIAL AND SCHEDULE CONTROLS
      SUPPORT RESOURCES
      SECURITY

QUALITY ASSURANCE

      CONFIGURATION MANAGEMENT PLAN
      DESIGN STANDARDS AND CONVENTIONS
      COORDINATE SYSTEM DEFINITIONS
      PROGRAMMING PRACTICES,
        STANDARDS AND CONVENTIONS
      TEST PROGRAM AND TEST DATA PLAN

STATINTL

PROJECT CONTROL DOCUMENTS (continued)

MANAGEMENT STATUS REPORTS

        FINANCIAL DATA
        CRITICAL PATH ANALYSES
        TECHNICAL PROBLEMS
        COMPUTER UTILIZATION

SUPPORT SYSTEMS

        DOCUMENTATION
        TRAINING
        SECURITY
        ACTIVATION

STATINTL

THE DATA ITEM DESCRIPTION

TITLE, NUMBER, DATE, AND OFFICE OF
   PRIMARY RESPONSIBILITY
USE (PURPOSE WITHIN OR FOLLOWING
   THE CONTRACT)
INTERRELATIONSHIP (PRECEDENT OR DE-
   PENDENT DOCUMENTS)
REFERENCES
PREPARATION INFORMATION

      TABLE OF CONTENTS
      APPLICABLE DOCUMENTS
      BOILERPLATE
      DETAILED CONTENT

      NON-REPETITIVE
      REPETITIVE

      FIGURES
      GLOSSARY
      INDEX
      APPENDICES

STATINTL

PROPOSAL EVALUATION

OBJECTIVES
PROCESSES AND PROCEDURES

LEGAL FACTORS
MANAGEMENT FACTORS

CRITERIA

ELEMENTS
SCORING

STATINTL

PROPOSAL EVALUATION OBJECTIVES

ELIMINATE UNRESPONSIVE OR INFEASIBLE APPROACHES

SOME BIDDERS DON'T KNOW THEY LACK NECESSARY
BACKGROUND
STATE OF THE ART IS NOT UNIFORMLY DISTRIBUTED

OBTAIN BEST VALUE FOR THE GOVERNMENT
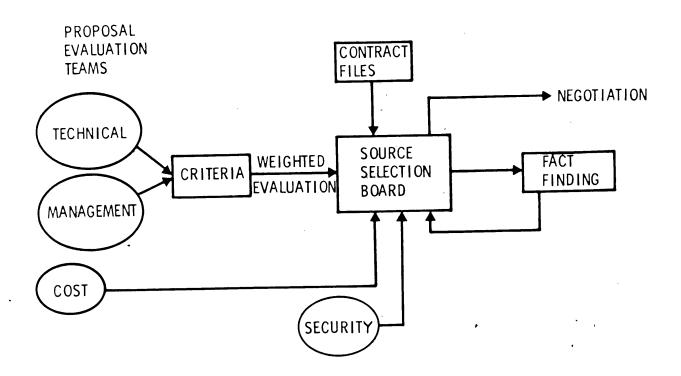
SHAVE UNNECESSARY FRILLS
ASSURE EFFORT COMMENSURATE WITH APPROACH
TRADE-OFF COST AND PERFORMANCE

ENFORCES OBJECTIVITY

MINIMIZE PERSONAL INFLUENCES
MAXIMIZE DEPENDENCY ON VERIFIABLE, RELEVANT,
AND BINDING INFORMATION

STATINTL

Proposal Evaluation Process

PROPOSAL
EVALUATION
TEAMS

TECHNICAL

MANAGEMENT

COST

CRITERIA → WEIGHTED EVALUATION

CONTRACT FILES

SOURCE SELECTION BOARD → NEGOTIATION

FACT FINDING

SECURITY

STATINTL

PROPOSAL EVALUATION PROCEDURES

ELIMINATING BIASES

> ROTATING ORDER
> NORMALIZING SCORES
> LIMITING EARLY INTERACTIONS

KEEPING RECORDS

> PARTICIPANTS
> CRITERIA ·
> WRITTEN CRITIQUES
> DISQUALIFYING FACTORS
> MINUTES OF DISCUSSIONS
> VOTING

USE OF SPECIALISTS AND CONSULTANTS

> PROBLEM PECULIAR
> PROPOSAL PECULIAR

STATINTL

TYPICAL DEVELOPMENT PROBLEMS

HARDWARE

      ACCURACY, SPEED, SENSITIVITY
      PACKAGING DENSITY
      WEIGHT/VOLUME/POWER
      RELIABILITY
      PHYSICAL SURVIVABILITY
      PRODUCTION QUALITY

SOFTWARE

      COST & SCHEDULE ESTIMATION & CONTROL
      IN-LINE DEPENDENCE ON OPERATING SYSTEM & COMPILER
      HIDDEN ERRORS
      DOCUMENTATION
      MAINTENANCE COSTS
      TRAINING REQUIREMENTS
      REQUIREMENTS GROWTH
      UNDERESTIMATED COMPUTE-POWER

STATINTL

TECHNICAL CRITERIA

REQUIREMENTS AUDIT

> TRACEABILITY
> IMPLEMENTATION

FEASIBILITY

> PRIOR APPLICATION
> DETAILED SIZING AND TIMING STUDIES
> ERROR ANALYSES
> SENSITIVITY OR TRADE-OFF STUDIES

STATINTL

TECHNICAL CRITERIA   (continued)

COMPLETENESS

    SOFTWARE

        DATA BASE ARCHITECTURE
        MATHEMATICAL ALGORITHMS
        HUMAN INTERFACES
        CONTROL OPTIONS
        OPERATING SYSTEM FEATURES
        DEVELOPMENT TOOLS

    HARDWARE

        LOGIC
        MOTION ANALYSIS
        INTERFERENCE ANALYSIS
        PRODUCABILITY
        RELIABILITY
        PACKAGING
        AUTOMATIC TEST EQUIPMENT

    OVERKILL

STATINTL

MANAGEMENT CRITERIA

PEOPLE AND ORGANIZATION

    RELATIONSHIP TO PROPOSAL DEVELOPMENT
    TIME COMMITMENT AND CURRENT ASSIGNMENTS
    STAFFING RATE FEASIBILITY
    INDEPENDENT TEST AND INTEGRATION

SYSTEMS AND PRACTICES

    EFFECTIVENESS
    TIMELINESS
    PROOF OF USE

STATINTL

MANAGEMENT CRITERIA (continued)

EXPERIENCE

PRIOR SIMILAR JOBS
LINKAGE TO INDIVIDUALS
REFERENCES

SCHEDULE

INTERNAL MILESTONES
REVIEW CYCLES
CRITICAL PATH DEVELOPMENT
CREDIBILITY

STATINTL

COST CRITERIA

BASIS

ENGINEERING ESTIMATES
TOTAL SCOPE OF EFFORT
REQUIRED LABOR MIX
OVERHEAD ELEMENTS

DEFINITIONS

MAN-HOUR
MONTH
COMPUTER TIME

STATINTL

COST CRITERIA (continued)

STANDARDS

JUDGING CREDIBILITY
ESTABLISHING ALLOWABLES

GOVERNMENT RESOURCES

COMPUTER TIME
MAN POWER
TRAVEL BUDGETS

LIFECYCLE ESTIMATES
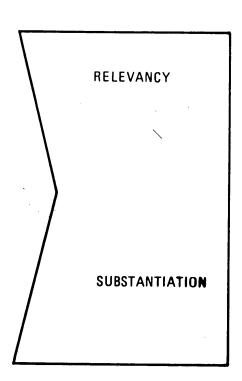
LIFE-SPAN
ACTIVITIES
DISCOUNT RATE

STATINTL

Proposal Evaluation Criteria

- TECHNICAL
    - REQUIREMENTS AUDIT
    - FEASIBILITY
    - COMPLETENESS
    - OVERKILL

- MANAGEMENT
    - PEOPLE AND ORGANIZATION
    - SYSTEMS AND PRACTICES
    - EXPERIENCE
    - SCHEDULE

- COSTS
    - BASIS
    - DEFINITIONS
    - STANDARDS
    - GOVERNMENT RESOURCES
    - LIFE CYCLE ESTIMATES

RELEVANCY

SUBSTANTIATION

STATINTL

Separating Fact From Fiction

- RELEVANCY
    - DOES IT HELP MEET THIS SYSTEMS OBJECTIVES?
    - DID IT INVOLVE THESE PEOPLE?
    - HAS IT BEEN ASKED FOR?
    - WAS THAT ENVIRONMENT (noise, data rate, schedule, cost) AS CONSTRAINING?

- SUBSTANTIATION
    - IS IT ASSERTED OR PROVEN?
    - WHAT DATA HAS BEEN USED? WHAT IS ITS SOURCE? HOW WAS IT COLLECTED?
    - WERE RECORDS KEPT, OR IS THIS A RECONSTRUCTION?
    - WOULD A DIFFERENT GROUP OF PEOPLE OR SET OF DATA YIELD THE SAME RESULTS?

STATINTL

STAFFING

THE SURPRISE OF WINNING
PROPOSAL TEAM TRANSITION
INTERNAL PRIORITY.
CLEARANCES
PROJECT "REPUTATION"

STATINTL

ORGANIZING

CONFLICTING CONTRACTS
POWER STRUGGLES
DIFFERENCES IN APPROACH
PERSONAL STRENGTHS

STATINTL

INTERPRETATION OF REQUIREMENTS

LIMITED MISSION OR TECHNOLOGY EXPERIENCE
LIMITED PROJECT BACKGROUND
MISDIRECTED PRIOR EXPERIENCE
CONTRADICTORY OPERATIONAL INPUT
AMBIGUOUS SPECIFICATION

STATINTL

LONG LEAD TIME PURCHASES

FAULTY PROJECT PLAN
LOW CORPORATE PRIORITY
INATTENTION

STATINTL

AVOIDING TROUBLE

MEET ALL KEY STAFF

TEST CONTRACTOR'S INTERPRETATION OF RQMTS

CALIBRATE MORALE

RECHECK VALIDITY OF PROJECT PLAN

TEST IMPLEMENTATION OF PROJECT PLAN

KEEP A TOTAL PROJECT PERSPECTIVE

TRACK INITIAL STAFFING & ORGANIZATION

WALK AND TALK

MEET FREQUENTLY WITH PROJECT MANAGER

BE A CUSTOMER, NOT A GUEST

ESTABLISH A POSITION OF BEING IN CONTROL

    INITIAL CONTACTS

    RFP

    BIDDERS CONFERENCE

    FACT-FINDING

    NEGOTIATIONS

USE FORMALITY TO MAINTAIN CONTROL

    AGENDAS

    MINUTES

    ACTION ITEMS

    CONFIGURATION CONTROL

USE INFORMALITY TO MAINTAIN RELATIONSHIPS

    PEOPLE ARE YOUR MOST IMPORTANT RESOURCE

    MANY REAL PROBLEMS REMAIN HIDDEN TO "THE SYSTEM"

    YOU PLAY A KEY ROLE IN MOTIVATING CONTRACTOR EMPLOYEES

STATINTL

GOLDEN RULES OF ACQUISITION

BE SPECIFIC
BE CONSISTENT
BE SKEPTICAL
BE PERSISTENT
BE TIMELY

STATINTL

TECHNICAL PROGRESS ASSESSMENTS

STATUS MEETINGS

TECHNICAL INTERCHANGE MEETINGS

WORKING GROUPS

PROGRESS BRIEFINGS

SPECIAL AUDIT TEAMS

DESIGN REVIEWS

STATINTL

DESIGN REVIEWS IN DETAIL

OBJECTIVES

DOCUMENTATION

PROCESS

USEFUL PROCEDURES

REVIEW MANAGEMENT

DESIGN REVIEW OBJECTIVES

MEASURE PROGRESS

REFOCUS ATTENTION ON REQUIREMENTS,
   INTERFACES & OPERATIONS

    ASSURE COMPLIANCE

    UNCOVER OVERSIGHTS

    IDENTIFY COST-DRIVERS

    ELIMINATE UNNECESSARY FRILLS

PROVIDE DEFINITIVE INTERMEDIATE MILESTONES

    IMPROVES SCHEDULE ADHERENCE

    PERMITS NOVEL INCENTIVE STRUCTURE

    BASIS FOR CONFIGURATION CONTROL

STIMULATE CONTRACTOR INTERNAL COMMUNICATIONS

    IMPROVED QUALITY

    EARLY IDENTIFICATION OF PROBLEMS

CONTRIBUTE TO TRAINING

    INTEGRATING CONTRACTOR

    OPERATORS/USERS

REFERENCE DOCUMENTS

SYSTEM SPECIFICATION

DEVELOPMENT SPECIFICATIONS

PRODUCT SPECIFICATIONS

CRITICAL PARTS LIST

DATA DICTIONARY

HDW/SW LIMITATIONS AND CONSTRAINTS

INTERFACE CONTROL DOCUMENTS

TEST PLAN

TEST PROCEDURES

TEST REPORT

USERS MANUAL

PROGRAMMING MANUAL

MAINTENANCE MANUAL

STATINTL

CONSTRUCTIVE DOCUMENT REVIEWS

- LOOK FOR THE BIG ISSUES
  - REQUIREMENTS SATISFACTION
  - COMPLETENESS
  - CONSISTENCY
  - ACCURACY/CORRECTNESS
  - KEEP EDITORIAL COMMENTS SEPARATE
- SAY WHAT YOU WANT & WANT WHAT YOU SAY
  - AVOID PHILOSOPHIZING
  - SUGGEST CORRECTION IF KNOWN
  - AVOID SARCASM
- REMEMBER YOUR OBJECTIVES
  - REQUIREMENTS
  - SCHEDULE
  - MONEY

STATINTL

USEFUL PROCEDURES

SYSTEM LEVEL REVIEWS

- FORCES CONTRACTOR TO VIEW SYSTEM AS A WHOLE
- SAME PEOPLE/SAME ROOM/SAME TIME IMPROVES COMMUNICATION
- RESOLVES UNCERTAIN RESPONSIBILITIES
- COORDINATES RESPONSE TO CRITICAL PROBLEMS

REQUIREMENTS TRACES

DESIGN
INTERFACES
TEST PLAN

DATA OR SIGNAL TRACES

UNCOVERS INTERFACE PROBLEMS
PROMOTES UNDERSTANDING OF PROCESSES

STATINTL

REVIEW MANAGEMENT

TEAM PREPARATION

    SELECTION
    TRAINING
    WORK LOAD BALANCE

SETTING OBJECTIVES

    REQUIREMENTS PRIORITIES
    KEY RISKS/ISSUES
    SELECTED THEMES

LOGISTICS

    DOCUMENT DISTRIBUTION
    COMMENT FORMS
    COMMENT COLLECTION

REVIEW MANAGEMENT (continued)

INTERNALLY COORDINATED RESPONSE

    ELIMINATES REDUNDANCY AND NOISE
    FOCUSES ATTENTION ON CRITICAL ITEMS
    DISCUSSION UNFOLDS NEW ISSUES
    DOCUMENTS INPUTS

DOCUMENTED PROCEEDINGS

    RECORDS RATIONALE
    REDUCES MISUNDERSTANDINGS
    PROMOTES FULLY DEFINED ACTION ITEMS
        (who, what, when)
    SIGNATURE ESTABLISHES CUSTOMER'S CONTROL

ACTION ITEM CLOSURE

    FOLLOW-UP REVIEW
    ACCOUNTING

STATINTL

ELEMENTS OF PROJECT CONTROL

DESCRIBE THE SYSTEM IN MEASURABLE TERMS

RACKS OF EQUIPMENT
CIRCUIT BOARDS
COMMERCIAL
CUSTOM
SOLDIER JOINTS

OPERATOR STATIONS
INPUT DEVICES
CONVENTIONAL
STATE OF THE ART
DISPLAY OPTIONS

SOFTWARE MODULES
NUMBER OF EQUATIONS OR ALGORITHMS
TEXT BOOK
NEW DERIVATIONS
LINES OF CODE

STATINTL

ELEMENTS OF PROJECT CONTROL

IDENTIFY DISCRETE MILESTONES ASSOCIATED WITH THE DESIGN,
DEVELOPMENT, PRODUCTION, TEST AND SUPPORT OF THE IDENTIFIED
SYSTEM

    PURPOSE DOCUMENTED
    FUNCTIONS DESCRIBED
    ARCHITECTURE APPROVED
    DESIGN COMPLETED
    FIRST TEST ATTEMPTED
    TEST COMPLETED
    INTEGRATION COMPLETED

PLAN, MEASURE AND CONTROL THE EFFICIENT APPLICATION OF
RESOURCES (PEOPLE, MATERIAL, RESOURCES, TIME) TO THE
ACHIEVEMENT OF MILESTONES

    LEARNING/PREPARATION
    CREATING/USING
    VALIDATING/CORRECTING
    IDLE

STATINTL

DESIGN CONCEPT REVIEW OBJECTIVES

ENHANCE AND CONFIRM UNDERSTANDING OF REQUIREMENTS
IDENTIFY AND/OR MODIFY HIGH COST OR HIGH RISK REQUIREMENTS
IDENTIFY, NEGOTIATE AND FREEZE EXTERNAL INTERFACES
REVIEW AND VALIDATE CONTRACTOR'S DEVELOPMENT PLAN
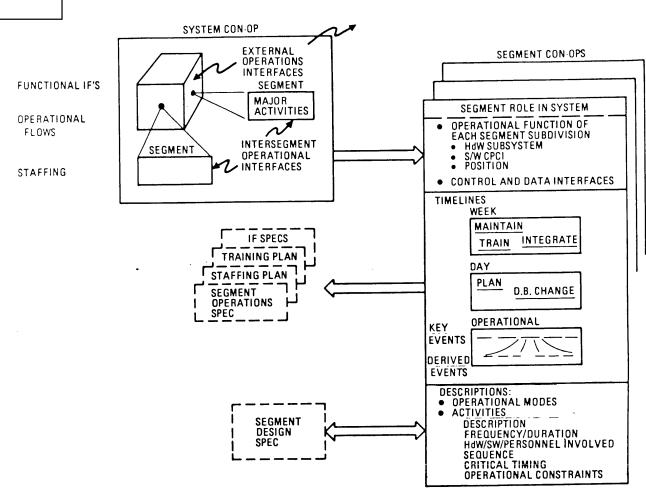
STATINTL

DCR AGENDA

OPERATIONS CONCEPT
REQUIREMENTS
TRADE STUDIES
DEVELOPMENT PLAN `
QUALITY ASSURANCE
CONFIGURATION CONTROL
REQUIREMENTS VERIFICATION
PRELIMINARY DEVELOPMENT SPECIFICATIONS

STATINTL

Concept of Usage

SYSTEM CON-OP

EXTERNAL
OPERATIONS
INTERFACES

SEGMENT

MAJOR
ACTIVITIES

FUNCTIONAL IF'S

OPERATIONAL
FLOWS

SEGMENT

INTERSEGMENT
OPERATIONAL
INTERFACES

STAFFING

SEGMENT CON-OPS

SEGMENT ROLE IN SYSTEM

- OPERATIONAL FUNCTION OF
EACH SEGMENT SUBDIVISION
  - HdW SUBSYSTEM
  - S/W CPCI
  - POSITION
- CONTROL AND DATA INTERFACES

TIMELINES
WEEK

MAINTAIN

TRAIN   INTEGRATE

DAY

PLAN   D.B. CHANGE

IF SPECS

TRAINING PLAN

STAFFING PLAN

SEGMENT
OPERATIONS
SPEC

KEY
EVENTS

OPERATIONAL

DERIVED
EVENTS

DESCRIPTIONS:
- OPERATIONAL MODES
- ACTIVITIES
  DESCRIPTION
  FREQUENCY/DURATION
  HdW/SW/PERSONNEL INVOLVED
  SEQUENCE
  CRITICAL TIMING
  OPERATIONAL CONSTRAINTS

SEGMENT
DESIGN
SPEC

STATINTL

HARDWARE REQUIREMENTS

GENERAL REQUIREMENTS

ENVIRONMENTAL COMPATIBILITY
RELIABILITY/MAINTAINABILITY/AVAILABILITY
OPERATIONAL SECURITY
FAULT DETECTION & ISOLATION
PRODUCIBILITY
LOGISTICS SUPPORT
TRANSPORTABILITY
DESIGN STANDARDS

STATINTL

HARDWARE REQUIREMENTS (continued)

ARCHITECTURE

    FUNCTIONALITY
    FAILURE MODES & EFFECTS
    TESTABILITY

INTERFACES

    FUNCTIONAL RELATIONSHIPS
    ELECTRICAL CONNECTIONS
    SIGNAL CODING
    MECHANICAL CONNECTIONS

STATINTL

HARDWARE REQUIREMENTS (continued)

FUNCTIONAL REQUIREMENTS

LOADS

SIGNALS

ACCURACY

TIMING

CONTROL

STATINTL

SOFTWARE REQUIREMENTS

GENERAL REQUIREMENTS

SECURITY/PRIVACY
ARCHIVING/RETRIEVAL
BACKUP/FALLBACK/RESTART
DESIGN STANDARDS

ARCHITECTURE

COMPUTER ENVIRONMENT
SCHEDULE/CONTRACTOR
OPERATIONAL ENVIRONMENT

STATINTL

SOFTWARE REQUIREMENTS (continued)

INTERFACES

DATA DESCRIPTION
VOLUME
MEDIA

FUNCTIONAL REQUIREMENTS

ACCURACY
THROUGHPUT
DETAILED TIMING
CONTROL

STATINTL

OPERATOR REQUIREMENTS

POSITION REQUIREMENTS

- DESCRIPTION OF ROLE
  TIMELINE
  WORKLOAD ANALYSIS
  SUPPORTING SUBSYSTEMS OR INFORMATION

TRANSACTION REQUIREMENTS

  TASK DESCRIPTION
  TIMELINESS REQUIRED
  ACTIONS REQUIRED
  ERROR EFFECTS, CONTROLS & RECOVERY
  DECISION DATA AND BASIS

STATINTL

FACILITY REQUIREMENTS

REQUIREMENTS

POWER
COOLING
SPACE
STRUCTURAL
SERVICES
ACCESS

CONSTRAINTS

SECURITY
LOGISTICS
OPERATIONS
SAFETY

STATINTL

TRADE-OFF OPPORTUNITIES

TOTALLY DIFFERENT ALTERNATE APPROACHES

MODIFIED ALLOCATION OF REQUIREMENTS BETWEEN SUBSYSTEMS

VARYING LEVELS OF RELIABILITY, MEAN LIFETIME

VARYING LEVELS OF PRESUMED THREAT LEVELS

MANNED VS UNMANNED SYSTEMS

FACTORY VS FIELD CALIBRATION

USE OF DEMONSTRATION PROGRAM OR PROTOTYPE DEVELOPMENT

STATINTL

DEVELOPMENT PLAN

DEVELOPMENT TASK WBS

    PLAN
    SPECIFY
    DESIGN
    PRODUCE
    VERIFY
    DOCUMENT

TASK SCHEDULES AND DEPENDENCIES

    MASTER TASK NETWORK
    MAJOR MILESTONE
    INTERNAL REVIEWS
    INTERNAL AND EXTERNAL DEPENDENCIES

STATINTL

DEVELOPMENT PLAN (continued)

STAFFING AND ORGANIZATION

    TASK RELATIONSHIP
    MANAGEMENT AND SUPPORT
    PROJECT/MATRIX ROLES
    TRAINING

FACILITIES

    DOCUMENT PRODUCTION
    HARDWARE ASSEMBLY & TEST
    SOFTWARE DEVELOPMENT
    SECURE SPACE AND STORAGE
    TEST DATA GENERATORS
    ANALYSIS TOOLS

MANAGEMENT & TECHNICAL CONTROLS

    COST REPORTING
    CRITICAL PERFORMANCE
    CONFIGURATION MANAGEMENT
    SECURITY

STATINTL

QUALITY ASSURANCE

ESTABLISH DEVELOPMENT STANDARDS
MONITOR COMPLIANCE
PROVIDE VENDOR PARTS INSPECTION
AUDIT DELIVERED PRODUCTS

STATINTL

CONFIGURATION CONTROL

IMPLEMENT MANAGEMENT CONTROL OF PRIORITIES
PREVENTS UNNECESSARY CHANGES
ASSURES INTERFACE COORDINATION
PROVIDES ORDERLY INTRODUCTION OF CHANGE
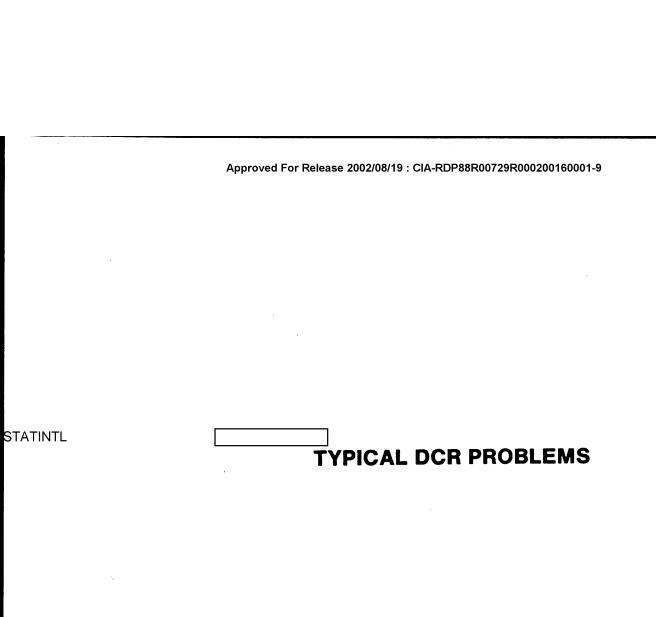
STATINTL

REQUIREMENTS VERIFICATION

REQUIREMENTS TRACEABILITY

VERIFICATION PLAN & MATRIX

INSPECTION
ANALYSIS
TEST/DEMONSTRATION

TEST PLANS AND PROCEDURES

STATINTL

TYPICAL DCR PROBLEMS

STATINTL

INCOMPLETE REQUIREMENTS ALLOCATION

CAUSES

    INEXPERIENCED CONTRACTOR
    POOR ANALYSIS TOOLS
    INADEQUATE SCHEDULE OR BUDGET

    FAILURE TO CONSIDER DERIVED REQUIREMENTS

CONSEQUENCES

    WASTED DESIGN EFFORTS

STATINTL

INCOMPLETE OPERATIONS CONCEPT

CAUSES

INSUFFICIENT USER CONTACT
INADEQUATE CONTRACTOR EXPERIENCE
INSUFFICIENT RESOURCES

CONSEQUENCES

ERRONEOUS INTERFACES
NON-TECHNICAL FACTORS IGNORED
IMPRACTICAL TIMELINES
UNREALISTIC TEST ENVIRONMENT

STATINTL

STAFFING DELAYS

CAUSES

    CORPORATE PRIORITIES
    UNREALISTIC PLANNING ASSUMPTIONS
    CHANGING LABOR MARKET
    CLEARANCES
    PROJECT REPUTATION

CONSEQUENCES

    IMPLEMENTATION DELAYS
    MORE MATURE PRECEDENT PRODUCTS

STATINTL

NON-OPTIMUM LABOR MIX

CAUSES

INEFFECTIVE MATRIX MANAGEMENT
DYNAMIC BUSINESS BASE

CONSEQUENCES

UNABLE TO WORK AROUND SCHEDULE CHANGES
AMPLIFIED COST IMPACT

STATINTL

UNACHIEVABLE SCHEDULE

CAUSES

POLITICAL PRESSURE
REQUIREMENTS GROWTH
POOR INTERFACE DEFINITION
BUDGET REPROGRAMMING
COMPETING PROJECTS

CONSEQUENCES

POOR MORALE
CONSTANT REPLANNING
WASTED EFFORT
COST & SCHEDULE GROWTH

STATINTL

DOCUMENT PRODUCTION DELAYS

CAUSES

UNDERESTIMATED WORKLOAD
DELAYED INPUT
LOW PROJECT PRIORITY
INADEQUATE FACILITY

CONSEQUENCES

INADEQUATE REVIEWS
MISSED MILESTONES

STATINTL

REQUISITES FOR PROGRESS ASSESSMENT

A PLAN

TECHNICAL
MANAGEMENT

INFORMATION

PROGRESS
RESOURCES
CONDITIONS

UNDERSTANDING OF INTERACTION

BUDGET VS PROGRESS BY ELEMENT
CRITICAL PATH ITEMS
PRECEDENCE RELATIONSHIPS

STATINTL

Quantified Measures

	REQ. ALLOC.	PRELIM. DESIGN & PROTOTYPE	CRITICAL DESIGN & DEVELOPMENT	PRODUCTION & TEST	INTEGRATION
HARDWARE	NO. OF CRITICAL REQUIREMENTS NO. OF FUNCTIONS NO. OF SUBSYSTEMS NO. OF OPERATING MODES NO. OF TBD's/TBR's PAGES OF DOCUMENTATION	RACKS OF EQUIPMENT NO. OF STRUCTURES NO. OF DISPLAYS NO. OF CABLES NO. OF ASSEMBLY POSITIONS NO. OF DRAWINGS NO. OF RISK ITEMS	NO. OF CIRCUITS NO. OF INTERFACES NO. OF INTERFACES HOURS OF BURN-IN NO. OF ENCLOSURES NO. OF MECHANISMS	UNITS COMPLETED TESTS COMPLETED UNITS ACCEPTED HOURS OF REASSEMBLY	NO. OF TESTS TESTS EXECUTED TEST PASSED TESTS IN ANALYSIS NO. PEOPLE TRAINED
SOFTWARE	NO. OF CRITICAL REQ. NO. OF FUNCTIONS NO. OF CPCI's NO. OF OPERATING MODES NO. OF TBD's/TBR's PAGES OF DOCUMENTATION	NO. OF MENU's DATA BASE SIZE NO. OF MODULES NO. OF CRITICAL ALGORITHMS NO. OF SPEC. COMMENTS NO. OF INTERACTIONS NO. OF DERIVED REQUIREMENTS	LINES OF CODE NO. OF DATA ITEMS SPEED OF EXECUTION WORDS OF MEMORY USED NO. OF CHANGES	PATHS EXECUTED MODULES COMPLETED LINES OF CODE PRODUCED TEST DATA DEVELOPED TESTS EXECUTED TESTS EXECUTED TESTS PASSED TESTS IN ANALYSIS	
OPERATIONS	NO. OF CRITICAL REQ. NO. OF POSITIONS NO. OF OPS. SCENARIOS NO. OF FUNCTIONS PAGES OF DOCUMENTATION	NO. OF CRITICAL TASKS NO. OF SLACK HOURS NO. OF ACTIONS HOURS OF TRAINING ITEMS TO BE MAINTAINED	NO. OF MANUALS NO. OF CHAPTERS NO. OF PAGES NO. OF PEOPLE TO BE TRAINED	NO. TRAINING SESSIONS DESIGNED NO. OF COPIES PRODUCED NO. OF PROCEDURES DEVELOPED	NO. PEOPLE TRAINED
SEGMENT	NO. OF INTERFACES	NO. OF TEST DRIVERS NO. OF TEST SCENARIOS	NO. OF ITERATIONS ON PLANS NO. OF WALLS CONSTRUCTED	HOURS OF TEST OUTLETS INSTALLED	NO. OF DEMONSTRATION NO. OF REQUIREMENTS SATISFIED

Milestones

ANALYSIS	DOCUMENT (SPECS)	PRODUCT	ACTIVITY (TESTS)
SUBJECTS IDENTIFIED	PURPOSE DEFINED	REQUIREMENTS DEFINED	PURPOSE DEFINED
OBJECTIVES STATED	AUDIENCE DESCRIBED	REQUIREMENTS APPROVED	PARTICIPANTS IDENTIFIED
APPROACH DEFINED	OUTLINE COMPLETED	ARCHITECTURE DEFINED	OBJECTIVES DEVELOPED
DATA IDENTIFIED	OUTLINE APPROVED	DEVELOPMENT APPROACHS PROPOSED	ENVIRONMENT DEFINED
DATA OBTAINED	1st DRAFT COMPLETED	DEVELOPMENT APPROACH SELECTED	SEQUENCE DEVELOPED
TOOLS IDENTIFIED	2nd DRAFT COMPLETED	PRODUCTION TOOLS DEFINED	RESOURCES IDENTIFIED
TOOLS DEVELOPED	DRAFT DISTRIBUTED	FACILITY REQUIREMENTS DEFINED	PARTICIPANTS NOTIFIED
OUTPUT RESULTS DEFINITIZED	DRAFT COMMENTS RETURNED	TEST REQUIREMENTS DEFINED	INSTRUCTIONS DEVELOPED
INTERMEDIATE STAGES DEFINED	COMMENTS INCORPORATED	DATA BASE DESIGNED	RESOURCES PROVIDED
STAGES ACCOMPLISHED	FINAL DRAFT COMPLETED	CONTROL LOGIC COMPLETED	ACTIVITY CONDUCTED
RESULTS OBTAINED	FINAL DRAFT APPROVED	DESIGN COMPLETED	ASSESSMENT COMPLETED
ANALYSIS CONCLUDED	PRODUCTION COMPLETED	PRODUCTION TOOLS AVAILABLE	LOGISTICS CONCLUDED
	DISTRIBUTION COMPLETED	INPUT/OUTPUT CODED	
		PROTOTYPE COMPLETED	
		PRODUCTION INITIATED	
		PRODUCTION COMPLETED	
		TEST INITIATED	
		TEST COMPLETED	
		PRODUCT SHIPPED	
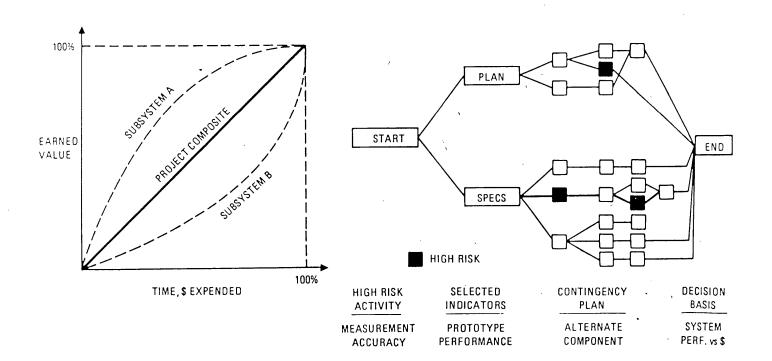
STATINTL

Earned Value Process (Cumulative)

	DCR	PDR	CDR	Assembly	System Test	Production	IOC

System Engineering

Hardware Development

Software Development

System Test

Production

Operations Support

Element	Planned Value	Actual		Deviation		Cause
		Value	Cost	Value	Cost	
〜〜〜	320K	240K	250K	-80K	+10K	Staffing/Salaries
〜〜〜	160K	80K	160K	-80K	+80K	Clock Stability

Balancing Progress

100%

EARNED
VALUE

SUBSYSTEM A

PROJECT COMPOSITE

SUBSYSTEM B

100%

TIME, $ EXPENDED

PLAN

START

END

SPECS

■ HIGH RISK

HIGH RISK ACTIVITY	SELECTED INDICATORS	CONTINGENCY PLAN	DECISION BASIS
MEASUREMENT ACCURACY	PROTOTYPE PERFORMANCE	ALTERNATE COMPONENT	SYSTEM PERF. vs $

STATINTL

Schedule Effects

- LARGE TEAM

- MANY INTERFACES/
  INTERACTIONS

- FREQUENT SLACK
  = HIGH WASTE

- INDEPENDENT FUNCTIONS

- OPTIMUM SKILL MIX
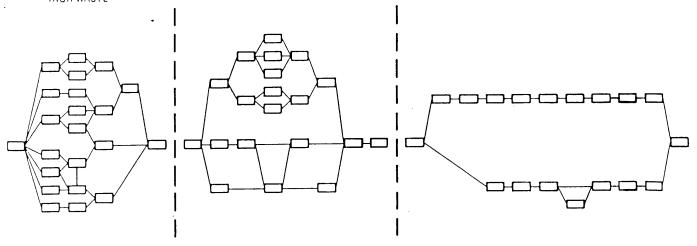
- HIGH PROBABILITY OF EXTERNAL
  CHANGES

- PERSONNEL TURNOVER

- SKILLS COMPROMISED
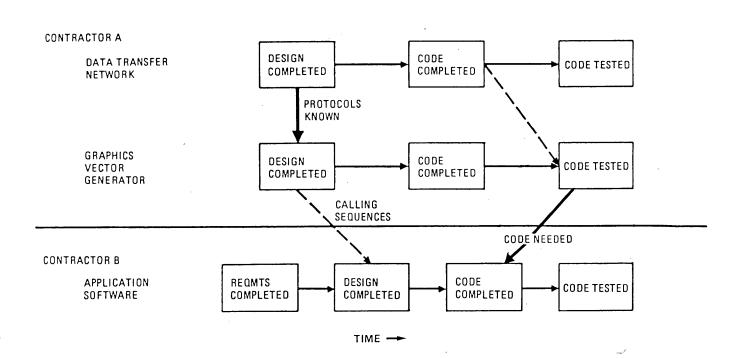
COMPRESSED   BASELINE   STRETCHED

STATINTL
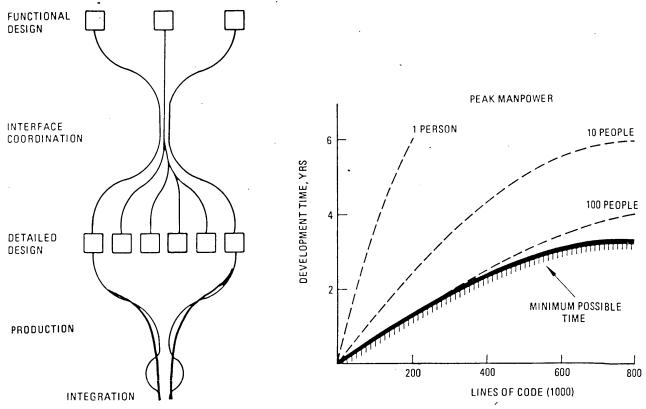
Development Interdependencies

CONTRACTOR A

    DATA TRANSFER
    NETWORK

| DESIGN COMPLETED | → | CODE COMPLETED | → | CODE TESTED |

PROTOCOLS KNOWN

    GRAPHICS
    VECTOR
    GENERATOR

| DESIGN COMPLETED | → | CODE COMPLETED | → | CODE TESTED |

CALLING SEQUENCES

CODE NEEDED

CONTRACTOR B

    APPLICATION
    SOFTWARE

| REQMTS COMPLETED | → | DESIGN COMPLETED | → | CODE COMPLETED | → | CODE TESTED |

TIME →

STATINTL

Bottlenecks & Interfaces
Limit Schedules

FUNCTIONAL
DESIGN

INTERFACE
COORDINATION

DETAILED
DESIGN

PRODUCTION

INTEGRATION

PEAK MANPOWER

1 PERSON

10 PEOPLE

100 PEOPLE

MINIMUM POSSIBLE
TIME

DEVELOPMENT TIME, YRS

6

4

2

LINES OF CODE (1000)

200   400   600   800

STATINTL

PROGRESS REPORTS

WORK REMAINING

    SUMMARY OF PLAN

    DETAILS OF DIVERGENCE

RESOURCES AVAILABLE

    MONEY

    PEOPLE

    COMPUTER TIME

    HARDWARE AND FACILITIES

    TIME

CORRECTIVE ACTIONS PROPOSED OR TAKEN

    MANAGEMENT

    TECHNICAL

STATINTL

How to Make Your Project Proceed
Exactly According to Plan

STATINTL

PDR OBJECTIVES

STABILIZE THE DESIGN ARCHITECTURE
DESCRIBE TRADEOFFS AND SELECTION RATIONALE
IDENTIFY KEY RISKS AND LONG-LEAD ITEMS
ESTABLISH TOTAL PROJECT STATUS
REFINE COST & SCHEDULE ESTIMATES
CONFIRM OR REVISE DEVELOPMENT PLAN

STATINTL

PRELIMINARY DESIGN REVIEW AGENDA

DCR PROBLEMS

FUNCTIONAL FLOW

ELECTRICAL SUBSYSTEMS

    CIRCUITS
    COMMUNICATIONS ENCODING
    POWER

MECHANICAL SUBSYSTEMS

    MECHANISMS
    STRUCTURES
    EXPLOSIVE DEVICES

DATA SUBSYSTEMS

    GENERAL
    COMPUTERS
    PERIPHERALS
    COMMUNICATIONS/DATA HANDLING EQUIPMENT
    OPERATOR STATIONS

PRELIMINARY DESIGN REVIEW AGENDA (continued)

SOFTWARE SUBSYSTEMS

INPUT & OUTPUT
CONTROL
PROCESSING & KEY ALGORITHMS
DATA BASE ARCHITECTURE
TIMING AND STORAGE

AVAILABILITY/RELIABILITY/MAINTAINABILITY

INTERFACE REQUIREMENTS

DEVELOPMENT PLAN REVISIONS

MANUFACTURING

PRELIMINARY TEST PLANS

SUPPORT TOOLS

SYSTEM TRANSITION AND INTEGRATION PLAN

STATINTL

OPERATIONAL REQUIREMENTS

OPERATOR REQUIREMENTS

    FUNCTIONS
    RESPONSE TIME
    SKILL
    ERROR CONDITIONS

OPERATIONAL CONSTRAINTS

    MUTUALLY EXCLUSIVE EVENTS
    MUTUALLY EXCLUSIVE OPERATIONAL REQUIREMENTS
    EXTERNAL INTERFACE DYNAMICS

STATINTL

ELECTRICAL SUBSYSTEMS DESIGN (continued)

GENERAL

SAFETY
    SECURITY
    CALIBRATION
    BUILT-IN-TEST

POWER

    PRIMARY SOURCE
    STORAGE DECAY CHARACTERISTICS
    LOADING ANALYSIS

CONTROLS

    RESPONSE CHARACTERISTICS
    STABILITY
    ACCURACY
    FAILURE ANALYSIS

STATINTL

ELECTRICAL SUBSYSTEMS DESIGN (continued)

COMMUNICATIONS

ERROR-DETECTION & CORRECTION TECHNIQUES
   AVERAGE & PEAK LOADING
   BUFFER REQUIREMENTS
   LINK MARGINS

SPECIAL CIRCUITS

   SYSTEM RESPONSE PROPERTIES
   RELIABILITY ANALYSIS
   FAILURE MODES & EFFECTS

STATINTL

ELECTRICAL SUBSYSTEMS DESIGN (continued)

SOLID STATE DEVICES

    SENSITIVITY
    DYNAMIC RANGE
    SATURATION CHARACTERISTICS

TRADE-OFF STUDIES

    WEIGHT vs LINK MARGIN
    SENSITIVITY vs SPATIAL COVERAGE
    POWER SHELF LIFE vs WEIGHT

STATINTL

MECHANICAL SUBSYSTEMS DESIGN

GENERAL

SAFETY MARGINS
ENVIRONMENTAL PROTECTION
OPERATING LIFE (CYCLES)

STRUCTURES

MATERIALS
OADS ANALYSIS
FAILURE ANALYSIS
THERMAL DISTORTION

MECHANICAL SUBSYSTEMS DESIGN   (continued)

MECHANISMS

    DESIGN APPROACHES
    CLEARANCES
    DYNAMIC ANALYSIS
    POWER REQUIREMENTS

HYDRAULIC

    PRESSURE VESSEL DESIGN
    SEALS
    VALVES
    RELIABILITY

STATINTL

MECHANICAL
SUBSYSTEMS DESIGN

THERMAL

ENVIRONMENTAL ANALYSIS
CONTROLS

PYROTECHNIC

SAFETY
STABILITY
RELIABILITY

STATINTL

DATA SUBSYSTEMS DESIGN

GENERAL

MTBF/MTTR
NOISE/HEAT/AIR VELOCITY
EMI
FAULT DETECTION
BUILT-IN-TEST

COMPUTERS

INSTRUCTION SET
EXECUTION RATE
I/O CHANNELS
WORD LENGTH

STATINTL

DATA SUBSYSTEMS DESIGN   (continued)

PERIPHERALS

I/O RATE
VOLUME
SEEK TIME
PRINT RATE

STATINTL

DATA SUBSYSTEMS DESIGN (continued)

.COMMUNICATIONS/DATA HANDLING EQUIPMENT

BANDWIDTH/DATA RATE

WORD LENGTH

ENCODING METHOD

NUMBER OF CHANNELS

STATUS MONITORING

ERROR DETECTION AND CORRECTION

BIT ERROR RATE

FAILURE RECOVERY MODES

STATINTL

DATA SUBSYSTEMS DESIGN (continued)

OPERATOR STATIONS

FUNCTIONS
INPUT DEVICES
DISPLAY CHARACTERISTICS
RESPONSIVENESS

TRADE-OFF STUDIES

BUILT-IN-TEST vs DEPOT MAINTENANCE
NET ERROR RATE vs NET DATA RATE
TRAINING TIME vs WORK LEVEL THROUGHPUT

STATINTL

SOFTWARE SUBSYSTEMS DESIGN

GENERAL

LANGUAGE
PROGRAMMING STANDARDS
COMMERCIAL HARDWARE
COMMERCIAL SOFTWARE
CONCURRENT REQUIREMENTS
SECURITY/PRIVACY

INPUT

DESCRIPTION
UNITS
SOURCE
RANGES/LIMITS
ACCURACY/PRECISION
FREQUENCY/VOLUME
MESSAGE FORMATS

STATINTL

SOFTWARE SUBSYSTEMS DESIGN   (continued)

PROCESSING

       FUNCTIONAL DESCRIPTION
       CONTROL OPTIONS
       COORDINATE SYSTEMS
       ACCURACY
       SEQUENCE OR TIMING
       KEY ALGORITHMS
       DATA BASE DESIGN STRUCTURE
       STIMULI AND RESPONSE
       THROUGHPUT
       RESPONSE TIME

OUTPUT

       DESCRIPTION
       DESTINATION
       UNITS
       ACCURACY/PRECISION
       FREQUENCY/VOLUME
       MESSAGE FORMATS

STATINTL

SOFTWARE SUBSYSTEMS DESIGN (continued)

CONTINGENCY RESPONSES

ERROR DETECTION/CORRECTION
BACKUP
FALLBACK
RESTART

MAN/MACHINE INTERFACE

CAPABILITY
RESPONSE TIME
DISPLAY DENSITIES/COLORS

TRADE-OFF STUDIES

RE-COMPUTATION TIME vs STORAGE
ACCURACY vs TIMING
MENU DRIVEN vs COMMAND DRIVEN
ON-LINE vs OFF-LINE ARCHIVING

STATINTL

DESIGN METHOD DIFFERENCES

HARDWARE

    PIECE PARTS AS BUILDING BLOCKS
    STANDARD PARTS AVAILABLE

        COMPONENTS
        CONNECTORS

TECHNOLOGY DIFFERENCES WELL QUANTIFIED

        MOS/BIPOLAR/CCD
        HONEYCOMB/COMPOSITES
        PCM/FDM/AM

NEW PARTS ARE DESIGNED WITH MULTIPLE APPLICATIONS IN MIND
FEW DECISIONS MADE "ON THE ASSEMBLY LINE" CAN EFFECT
    PERFORMANCE

STATINTL

DESIGN METHOD DIFFERENCES (continued)

SOFTWARE

    ROUTINE IS THE BUILDING BLOCK

    ONLY BASIC MATH BUILDING BLOCKS

        TRIG FUNCTIONS

        SOME STATISTICAL AND SIGNAL ANALYSIS PACKAGES

        LIMITED DATA BASE OPTIONS

        AVAILABILITY VARIES WITH HOST MACHINE MARKET SIZE

    TECHNOLOGY DIFFERENCES HOTLY DEBATED
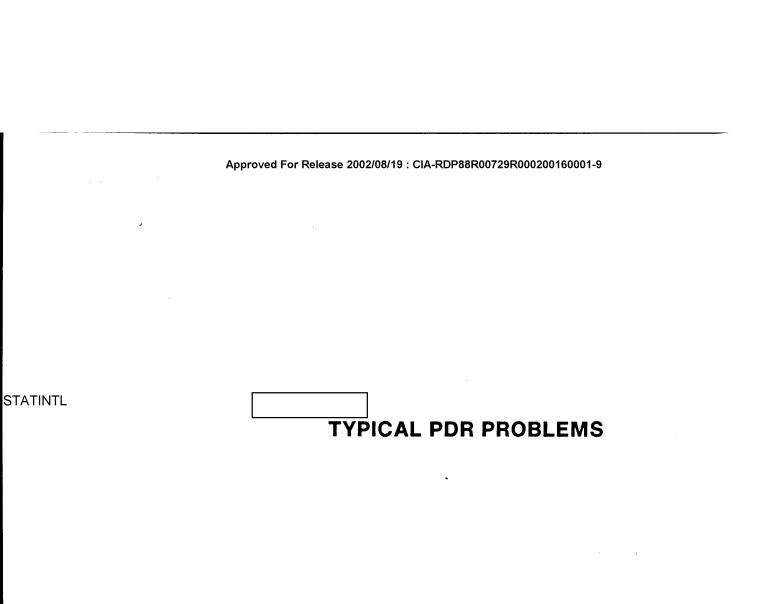
        ADA vs JOVIAL vs FORTRAN

        RELATIONAL vs HIERARCHICAL DATA STRUCTURES

    NEW ROUTINE ARE DESIGNED ONLY FOR THIS APPLICATION

    MANY DECISIONS MADE "ON THE ASSEMBLE LINE" EFFECT
        PERFORMANCE

STATINTL

PRELIMINARY TEST PLANS

TEST PROGRAM PHILOSOPHY & STRUCTURE
TEST DESCRIPTIONS
SUCCESS CRITERIA
TEST SEQUENCE
INPUT AND ANALYSIS PREPARATION
RESOURCES
CONTROLS AND REPORTING

STATINTL

TYPICAL PDR PROBLEMS

STATINTL

POOR INTERFACE DEFINITION

CAUSES

WEAK INTEGRATOR
ASYNCHRONOUS SCHEDULES
PROFIT MOTIVE

CONSEQUENCES

DESIGN GAPS
SCHEDULE SLIP

STATINTL

INCOMPLETE SYSTEMS ENGINEERING

CAUSES

    BUDGET SQUEEZE

    INADEQUATE SOW

    UNAGGRESSIVE LEADERSHIP

    CONTRACTOR INEXPERIENCE

    ERROR SOURCES NOT RECOGNIZED

CONSEQUENCES

    UNATTAINABLE ACCURACY SPECIFICATIONS

    DEGRADED AVAILABILITY

    INCREASED FAILURE IMPACT

    MISSED TIMELINES

    DIMINISHED SENSITIVITY

    LOST DATA

    INVALID ARCHITECTURE

    LATE REQUIREMENTS ADDED

    COST AND SCHEDULE GROWTH

STATINTL

INCOMPLETE OPERATOR POSITION DEFINITION

CAUSES

INSUFFICIENT USER CONTACT
UNSKILLED CONTRACTOR

CONSEQUENCES

REDUCED SYSTEM THROUGHPUT
LATE DEFINITION OF OUTPUT REQUIREMENTS

STATINTL

UNIDENTIFIED LONG-LEAD ITEMS

CAUSES

    INCOMPLETE TEST PLANNING
    INCOMPLETE PRODUCTION PLANNING
    GOVERNMENT FURNISHED DATA

CONSEQUENCES

    COST & SCHEDULE GROWTH

STATINTL

POOR QUALITY DOCUMENTATION

CAUSES

    LACK OF EXPLICIT GUIDANCE
    UNREALISTIC SCHEDULE
    INEFFECTIVE INTERNAL REVIEWS
    BAD WRITERS

CONSEQUENCES

    DIFFICULT TRANSITION BETWEEN PHASES
    COST & SCHEDULE GROWTH

STATINTL

INADEQUATE SUBCONTRACT VISIBILITY

CAUSES

    CONTRACT FLAWS
    PASSIVE GOVERNMENT PROGRAM OFFICE
    CONTRACTOR STRATEGY

CONSEQUENCES

    MISSED OPPORTUNITIES
    REACTIVE GOVERNMENT ROLE

UNINFORMATIVE PROGRESS REPORTS

CAUSES

    QUALITATIVE REPORTING
    NO COMPARISON TO A PLAN
    TOO HIGH A LEVEL OF SUMMARY
    TOO MUCH DETAIL
    OUTDATED INFORMATION

CONSEQUENCES

    HIDDEN PROBLEMS
    COST AND SCHEDULE GROWTH
    COUNTERPRODUCTIVE ACTIONS

STATINTL

REQUIREMENTS RISK

SOURCES

    ILL-DEFINED MISSION
    LACK OF USER CONSENSUS
    POORLY UNDERSTOOD ENVIRONMENT

CLUES

    CONFLICTING SUB-MISSION PRIORITIES
    DIVERSE OPINIONS REGARDING SOLUTION CHARACTERISTICS
    LACK OF DEFINITION

REDUCTION

    USER COORDINATION
    ENVIRONMENTAL SAMPLING
    CONCEPT DEFINITION PHASE

STATINTL

TECHNICAL RISK

SOURCES

PHYSICAL PROPERTIES
DESIGN INSTABILITY
UNREALISTIC PERFORMANCE
UNPROVEN LONG TERM EFFECTS
SHORTSIGHTEDNESS

CLUES

LAGGING DEFINITION OF PROJECT ELEMENTS
UNCALIBRATED ASSUMPTIONS
CONTRARY OPINIONS

REDUCTION

DESIGN REVIEWS
PROTOTYPES
MULTIPLE PROCUREMENTS

MECHANICAL SYSTEMS

SOURCES

  MATERIAL PROPERTIES
  ENVIRONMENTAL RESPONSE
  SAFETY MARGIN ·
  DYNAMIC DISTORTION

ESTABLISHING EXTENT

  LABORATORY TESTS
  ENVIRONMENTAL SAMPLING
  ENGINEERING ANALYSIS

STATINTL

ELECTRONIC SYSTEMS

SOURCES

COMPONENT STABILITY
PACKAGING DENSITY
PRODUCTION YIELDS
ENVIRONMENTAL AGING

ESTABLISHING EXTENT

LABORATORY TESTS
PROTOTYPE DEVELOPMENT
ENVIRONMENTAL TESTS
QUALITY CONTROL SYSTEMS
COMPUTER AUTOMATED DESIGN

STATINTL

COMPUTERS

SOURCES

    RESOURCE CONTENTION
    RESPONSE UNDER LOAD
    SOFTWARE RESOURCE DEMANDS

ESTABLISHING EXTENT

    BENCHMARK TESTING
    DETAILED SIMULATION
    USER SURVEYS

STATINTL

SOFTWARE

SOURCES

COMPILER/OPERATING SYSTEM MATURITY
COMPUTER ARCHITECTURE COMPATIBILITY
PROBLEM DOMAIN KNOWLEDGE
UNREALISTIC PERFORMANCE LEVELS

ESTABLISHING EXTENT

SOFTWARE USER SURVEYS
CONTRACTOR SITE OBSERVATIONS
DETAILED SIMULATION

STATINTL

SOFTWARE vs HARDWARE

CATCH-ALL FOR PROBLEMS

    CANNOT BE SOLVED IN HARDWARE
    DON'T KNOW HOW TO IMPLEMENT IN HARDWARE
    TOO ILL-DEFINED FOR HARDWARE
    CATCH-UP FOR EARLY DESIGN OVERSIGHTS

REQUIRE KNOWLEDGE OF OTHER "DESIGNS"

    DATA COLLECTOR OPERATIONAL PARAMETERS
    REAL-TIME DATA CORRUPTION
    OPERATOR "PREFERENCES"
    EXISTING ACCOUNTING PROCEDURES

STATINTL

SOFTWARE vs HARDWARE (continued)

MORE INTERFACES PER MODULE

HARDWARE
    CONNECTORS
    SWITCHES
    (USUALLY) WELL DEFINED INPUT/OUTPUT
SOFTWARE
    OPERATOR CONTROLS
    OPERATING MODES
    DISPLAY OPTIONS
    MYRIAD OF DATA INTERFACES
    EMBEDDED INTERFACES (DATA-DRIVEN BRANCHES)

STATINTL

SOFTWARE vs HARDWARE   (continued)

INTANGIBLE DESIGN

    CANNOT BE TOUCHED OR SEEN

    CONCEPTUAL IN NATURE

    "EASY TO CHANGE"

YOUNGER TECHNOLOGY

    CHANGING STANDARDS & CONVENTIONS

    CHANGING DESIGN METHODS

STATINTL

COST & SCHEDULE RISK

SOURCES

    REQUIREMENTS & TECHNICAL

    CONTRACT TERMS

    CONTRACT DELAYS

    MANAGEMENT

    UNCONTROLLABLE

CLUES

    FREQUENT CHANGES TO PLANS

    NO CHANGES TO PLANS

    UNDER OR OVER STAFFING

    MISSED MILESTONES

REDUCTION

    SPECIAL AUDITS

    SUBCONTRACTS

    PHASED DELIVERIES

CDR OBJECTIVES

VALIDATE DESIGN APPROACH AND STANDARDS
AFFIRM TEST, INTEGRATION AND TRANSITION RESOURCES
ASSURE ADEQUATE TEST PROGRAM
CALIBRATE DEVELOPMENT PROGRESS

STATINTL

CRITICAL DESIGN REVIEW AGENDA

PDR PROBLEMS
PRODUCT SPECIFICATIONS

  DETAILED FLOW DEFINITION
  PROCESS DESCRIPTIONS
  SCHEMATIC DIAGRAMS
  PROTOTYPE RESULTS

DATA BASE SPECIFICATION

  FILE STRUCTURE
  ITEM DESCRIPTIONS
  INDEXING/LINKAGE

INTERFACE SPECIFICATIONS

  ENCODING
  PROTOCOLS
  CONNECTOR DESIGNS

STATINTL

ASSEMBLY TOOLING
PARTS INSPECTION RESULTS
TEST PLANS

TEST RELATIONSHIPS

DATA SOURCES

TEST EQUIPMENT

PRELIMINARY PROCEDURES

ACCEPTANCE CRITERIA

INSTALLATION DRAWINGS
RELIABILITY
SAFETY
SUPPORT DOCUMENTATION

EQUIPMENT OPERATION MANUALS

LOGISTIC SUPPORT PLANS

STATINTL

HARDWARE SPECIFICATIONS

ELECTRICAL

    CIRCUIT LAYOUTS
    POWER BUSSES & GROUNDING
    SHIELDING DESIGN

MECHANICAL

    FINAL DRAWINGS
    FINAL PACKAGING
    FINISH INSTRUCTIONS

THERMAL CONTROL

    COATING SPECIFICATIONS

ELECTRO-MECHANICAL INTERFACES

    CONNECTORS
    LINKAGES

STATINTL

HARDWARE SPECIFICATIONS (continued)

MASS PROPERTIES

    SIZE
    WEIGHT
    INERTIAL PROPERTIES

PACKAGING & TRANSPORTATION

    SHOCK & VIBRATION MOUNTINGS
    THERMAL WRAPS
    STATIC DISCHARGE WRAPS

RELIABILITY/MAINTAINABILITY/AVAILABILITY

    PARTS INSPECTION PROGRAM
    ENVIRONMENTAL TESTING
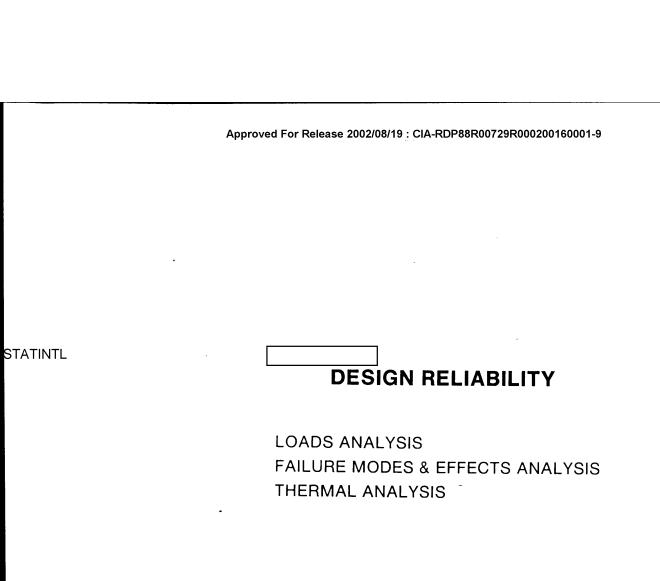
SAFETY/SECURITY

    SWITCH COVERS
    DESTRUCTIVE DEVICES
    SHIELDING

STATINTL

DESIGN ANALYSIS & TEST DATA

DETAILED LOGIC DIAGRAMS
CIRCUIT DIAGRAMS
PROCESSING ALGORITHMS
TIMING ANALYSIS
INPUT/OUTPUT DATA LINES

STATINTL

DESIGN RELIABILITY

LOADS ANALYSIS

FAILURE MODES & EFFECTS ANALYSIS

THERMAL ANALYSIS

STATINTL

PRODUCIBILITY

MANUFACTURING TECHNOLOGY
ASSEMBLY TOOLING
ASSEMBLY PLAN
PARTS AVAILABILITY
QUALITY CONTROL

STATINTL

SOFTWARE SPECIFICATIONS

INPUT

    NAME

    FORMAT

    DEVICE

    PRIORITY

STATIC DATA

    NAME

    DEVICE

    NUMBER OF RECORDS OR ENTRIES

    DEFINITIONS

STATINTL

SOFTWARE SPECIFICATIONS (continued)

CPC DESIGN

LOGIC
DATA FLOW
ERROR CHECKS
ERROR MESSAGES/RESPONSES
EQUATIONS
ALGORITHMS
INTERNAL VARIABLES
CALLING RELATIONSHIPS
BUFFERS/TEMPORARY STORAGE
INTERRUPTS

STATINTL

SOFTWARE SPECIFICATIONS (continued)

GRAPHIC REPRESENTATION

    SEQUENCE
    ITERATION
    BRANCHES

OUTPUT

    DISPLAY FORMATS/MEANS
    RECIPIENTS/NOTIFICATION
    FILE FORMAT
    STORAGE DEVICE

LIMITATIONS OR CONSTRAINTS
MEMORY AND STORAGE ALLOCATIONS
CRITICAL TIMING

STATINTL

DATA BASE SPECIFICATION

LOGICAL DESCRIPTION

FILE-RECORD-FIELD DESCRIPTIONS
USE
FORMAT DEFINITIONS
POINTERS AND CHAINS
MARKERS

FUNCTIONAL DESCRIPTION

SET/USE
ARCHIVING
PURGING

PHYSICAL DESCRIPTION

FILE SIZE
DEVICE ALLOCATIONS
RECORDING FORMATS, DENSITY, PARITY

PASSWORD ACCESS

STATINTL

SEGMENT DESIGN INTERFACES

SOFTWARE/DATA BASE

    DATA TRANSFERS
    REDUNDANCY/ARCHIVING
    PRIVACY

SOFTWARE/HARDWARE

    CONTROL
    COMPUTATIONAL RESOURCES

OPERATIONS/SOFTWARE

    DATA ENTRY AND RETRIEVAL
    SYSTEM OPERATIONS CONTROL
    SOFTWARE EXECUTION LEVELS

OPERATIONS/HARDWARE

    DISPLAY AND CONTROL DEVICES CHARACTERISTICS
    MESSAGE AND ALARM CHARACTERISTICS

STATINTL

REQUIREMENTS VERIFICATION
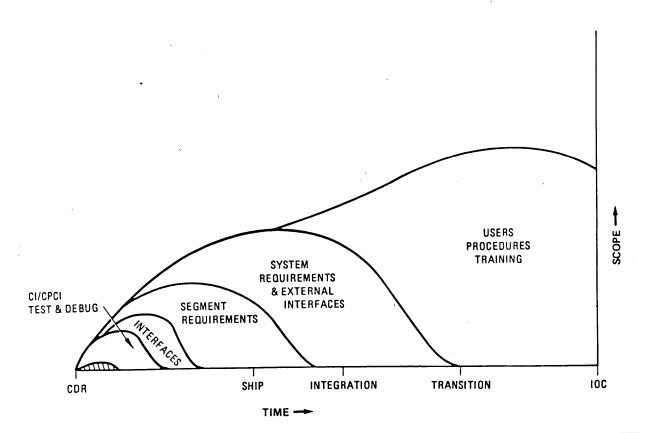
. SPECTRUM OF METHODS AND ACTIVITIES

TESTING

PITFALLS

STATINTL

The Verification Spectrum

USERS
PROCEDURES
TRAINING

SYSTEM
REQUIREMENTS
& EXTERNAL
INTERFACES

CI/CPCI
TEST & DEBUG

SEGMENT
REQUIREMENTS

INTERFACES

SCOPE →

CDR   SHIP   INTEGRATION   TRANSITION   IOC

TIME →

STATINTL

REQUIREMENTS VERIFICATION METHODS

INSPECTION

    TRAINING PROGRAM
    EQUIPMENT SURFACE FINISH
    MODULARITY

ANALYSIS
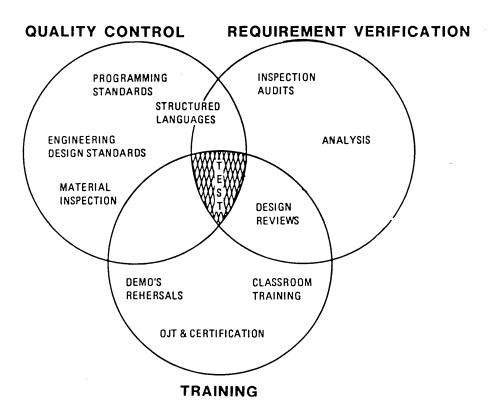
    AVAILABILITY
    ACCURACY

TEST

    RESPONSE TIME UNDER LOAD
    OPERATING MODES

STATINTL

The Three Faces of Testing

QUALITY CONTROL   **REQUIREMENT VERIFICATION**

PROGRAMMING
STANDARDS
          STRUCTURED
          LANGUAGES

INSPECTION
AUDITS

ENGINEERING
DESIGN STANDARDS

ANALYSIS

MATERIAL
INSPECTION

TEST

DESIGN
REVIEWS

DEMO'S
REHERSALS

CLASSROOM
TRAINING

OJT & CERTIFICATION

TRAINING

STATINTL

EVOLVING TEST ACTIVITIES

CODE AND DOCUMENTATION REVIEW

BENCH TEST RESULTS

ANALYSIS RESULTS

CONTROLLED TESTS

KNOWN INPUT

SIGNAL PROFILE
TORQUE
CHECK NUMBER

DETERMINISTIC OUTPUT

ENERGY MEASURE
YIELD STRAIN
AMOUNT PAYABLE

STATINTL

EVOLVING TEST ACTIVITIES
(Continued)

DEMONSTRATION TESTS

    CALIBRATED INPUT

        DYNAMIC LOADS PROFILE
        SIGNAL ENVIRONMENT TAPE
        DAILY ACCOUNT ACTIVITY

    BOUNDED RESULTS

        DEFLECTION HISTORY
        REPORTS TIMELINE
        SYSTEM RESPONSE TIME

STATINTL

TEST ACTIVITIES AND PROCEDURES

REQUIREMENTS SATISFACTION

DATA BASE ADEQUACY
PRIOR CALCULATIONS AND BASELINES
PARTIAL SATISFACTION

TEST PROGRAM MANAGEMENT

TEST TEAM STAFFING
SCHEDULING FIXED RESOURCES
TEST SEQUENCE PRECEDENCE RELATIONSHIPS
TEST REQUIREMENTS SATISFACTION MATRIX

FINAL AUDITS

PRIORITIZE PRODUCTS
PROPORTIONAL TO TEST INDUCED CHANGES

LIENS AND WAIVERS

STATINTL

TEST SCHEDULING PITFALLS

OPTIMISM

    FAILURE RATE
    PROBLEM ISOLATION
    TIME TO REPAIR
    ANALYSIS TIME

OVERSIGHTS

    RECONFIGURATION TIME
    COMPUTER AVAILABILITY
    FACILITY OPERATIONAL REQUIREMENTS

EFFICIENCY

    RESCHEDULING RESPONSE TIME
    PERSONNEL AVAILABILITY
    RECOMPILE/RECONNECT TIME

STATINTL

SEGMENT TEST PLAN

TEST PROGRAM PHILOSOPHY AND STRUCTURE

FUNCTIONAL/INTERFACES
RE-TESTING
DRIVERS/STUBS
ON-SITE TESTING
BUILD SEQUENCE

TEST DESCRIPTIONS

RANGE OF CONDITIONS
TEST DATA OR ENVIRONMENT
ACCEPTANCE CRITERIA

STATINTL

SEGMENT TEST PLAN (continued)

TEST FLOW

INTERRELATIONSHIPS
DEPENDENCIES

IMPLEMENTATION PLAN

EXTERNAL DATA & CONTINGENCY PLANS
SCHEDULE
EQUIPMENT/SOFTWARE/PERSONNEL NEEDED

MANAGEMENT CONTROLS

STATINTL

SEGMENT TEST PROCEDURE

TEST OBJECTIVES

    GENERAL

    MEASURABLE

OPERATING PROCEDURES

    SWITCH SETTINGS

    TAPE MOUNTING

    POSITION MANNING AND FUNCTION

    OPERATING SEQUENCE

    OPERATOR INTERVENTION INSTRUCTIONS

STATINTL

SEGMENT TEST PROCEDURE

DETAILED DESCRIPTION

    INTERFACE REQUIREMENTS
    TEST SCENARIO
    OPERATOR DATA REQUIREMENTS
    TEST DATA BASE DEFINITION
    . SIMULATED INPUT DATA
    OPERATING MODE DEFINITION
    OBSERVABLE EVENTS - SEQUENCE AND DEPENDENCY
    INSTRUMENTATION OR RECORDING REQUIREMENTS

ANALYSIS PROCEDURES

    DATA REDUCTION OR SUMMARY FORMATS
    STATISTICAL METHODS AND EQUATIONS
    REQUIRED DATA CONVERSIONS OR HAND CALCULATIONS

ACCEPTANCE CRITERIA

STATINTL

ACCEPTANCE CRITERIA

WHAT SPECIFIC TANGIBLE EVIDENCE CAN BE PRODUCED
CAN THE INTERPRETATION BE AMBIGUOUS?
IS SATISFACTION DIRECTLY OBSERVED OR IS IT IMPLIED
ARE GUIDELINES FOR INPUT CONDITIONS COMPLETE?

- CAN UNSATISFACTORY PERFORMANCE PASS
  ACCEPTANCE?

WHAT MINIMUM PERFORMANCE WOULD BE ACCEPTED BY
A COURT?

STATINTL

INTERFACE DEFINITION PROBLEMS

STATEMENT OF WORK CONFLICTS
CONTRACT TYPE DIFFERENCES
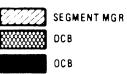TECHNICAL AMBIGUITIES
SCHEDULE SYNCHRONIZATION

STATINTL

CHANGE CONTROL

CONTROL RESOURCE PRIORITIES
PREVENT UNNECESSARY CHANGES
ASSURE INTERFACE COORDINATION
PROVIDE ORDERLY INTEGRATION OF CHANGE

STATINTL

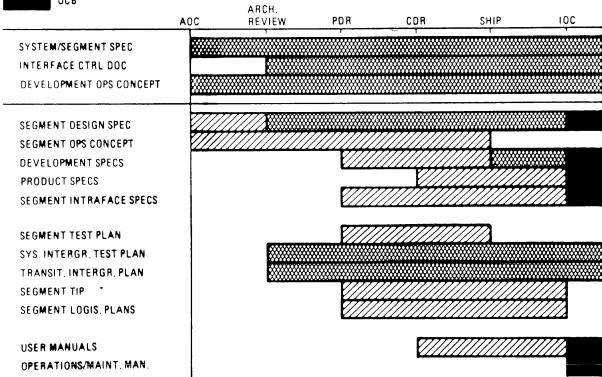# Configuration Control Authority

SEGMENT MGR

OCB

OCB

	AOC	ARCH. REVIEW	PDR	CDR	SHIP	IOC
SYSTEM/SEGMENT SPEC						
INTERFACE CTRL DOC						
DEVELOPMENT OPS CONCEPT						
SEGMENT DESIGN SPEC						
SEGMENT OPS CONCEPT						
DEVELOPMENT SPECS						
PRODUCT SPECS						
SEGMENT INTRAFACE SPECS						
SEGMENT TEST PLAN						
SYS. INTERGR. TEST PLAN						
TRANSIT. INTERGR. PLAN						
SEGMENT TIP						
SEGMENT LOGIS. PLANS						
USER MANUALS						
OPERATIONS/MAINT. MAN.						

STATINTL

FACILITY REQUIREMENTS

AREA

POWER

COOLING & CIRCULATION

   AIR

   WATER

COMMUNICATIONS

ELECTROMAGNETIC RADIATION

SOUND

INTERCONNECTIONS

STATINTL

INSTALLATION ISSUES

MECHANICAL

    STRUCTURAL SUPPORTS
    ACCESS CLEARANCE
    MANUFACTURING TOLERANCES

ELECTRICAL

    CABLE LENGTHS AND ATTENUATION
    ISOLATION/SHIELDING
    SWITCHES
    MODULATION, ENCODING, POLARITY
    GROUNDING

ENVIRONMENTAL

    CONTROL OPTIONS
    RANGES

STATINTL

FACILITY MODIFICATION CONCERNS

IMPACT DURING MODIFICATION

FUNCTIONALITY IN OPERATION

SYSTEM DESIGN IMPACT

LEAD TIME & INTERDEPENDENCES

STATINTL

SITE TESTING

COMPLETE SEGMENT TESTS AS REQUIRED

VALIDATE SYSTEM INTERFACES

LAGGING PROBLEM FIXES

DEMONSTRATE KEY REQUIREMENTS SATISFACTION

UNIFY HARDWARE, SOFTWARE, PERSONNEL, PROCEDURES
AND LOGISTIC SUPPORT

STATINTL

SITE TESTING PITFALLS

STRUCTURAL DEPENDENCE ON DELIVERY
  SCHEDULES
DATA SOURCES
CONTRACTOR MAINTENANCE
OPERATIONAL IMPACT

STATINTL

TRANSITION TEST OBJECTIVES

ESTABLISH SYSTEM PERFORMANCE WITHIN OPERATIONAL
FRAMEWORK

  PERSONNEL
  PROCEDURES
  FACILITIES
  LOGISTICS

CONFIRM TOTAL SYSTEM CAPABILITY

  OPERATING MODE CONTINUITY
  THROUGHPUT
  TIMELINESS UNDER LOAD
  ERROR DETECTION AND RECOVERY

RECONFIRM CAPABILITIES NOT INTENDED TO CHANGE

STATINTL

TRANSITION TEST PLANNING PROBLEMS

LIEN IMPACTS ON TEST OBJECTIVES

OPERATIONAL IMPACTS

  PERSONNEL
  EQUIPMENT UTILIZATION
  DATA BASE CONTROL

OPERATIONAL RISKS

  FAILURE ISOLATION
  RECOVERY CAPABILITY
  DATA INTEGRITY

STATINTL

TRANSITION TEST PLANNING PROBLEMS (continued)

PROBLEM ISOLATION ANALYSIS

OPERATIONAL ROLE
DEVELOPMENT CONTRACTOR ROLE

SIMULATED INPUTS AT EXTERNAL INTERFACES

UNCONTROLLED LIVE SYSTEMS AND DATA

POSTMORTEM

TRAINING

USER

    CAPABILITIES
    ARCHITECTURE
    PRODUCTS
    APPLICATIONS

OPERATOR

    OPERATIONAL POSITIONS

        FUNCTIONS
        INPUTS
        OUTPUTS
        CONTROLS
        DISPLAYS

    COMPUTER SYSTEMS
    DATA MANAGEMENT
    SPECIALIZED HARDWARE
    CONSTRAINTS OR LIMITATIONS
    USE OF DOCUMENTATION

STATINTL

TRAINING (continued)

MAINTENANCE

- DIAGNOSTIC TOOLS/SELF TEST
- FAILURE MODE INTERACTIONS & SYMPTOMS
- USE OF DOCUMENTATION

PLANNING FACTORS

- NUMBER AND AVAILABILITY OF TRAINEES
- RECERTIFICATION REQUIREMENTS
- EQUIPMENT AVAILABILITY

STATINTL

LOGISTIC SUPPORT ELEMENTS

CONTINUING TRAINING AND CERTIFICATION

> SYSTEM TRAINING
> POSITION TRAINING
> RECERTIFICATION

MAINTENANCE

> HARDWARE PREVENTATIVE MAINTENANCE
> HARDWARE REPAIR
> SOFTWARE MODIFICATION
> SOFTWARE REPAIR

SPARES & SUPPLIES

STATINTL

MEMORIZE YOUR CONTRACT

REQUIREMENTS

STATEMENT OF WORK

TERMS AND SCHEDULES

STATINTL

MAINTAIN USER CONTACT

KNOW HIS NEEDS

KNOW YOUR CONTRACTOR'S CAPABILITIES

UNDERSTAND COST/SCHEDULE/PERFORMANCE TRADES

SELL YOUR PRODUCT

STATINTL

NURTURE PEOPLE

VALUABLE INFORMATION SOURCES

LONG-TERM GOVERNMENT BENEFITS

PERSONAL SATISFACTION

STATINTL

LOOK FOR ASSUMPTIONS

MEANING OF WORDS

GROUND-RULES

SIDE EFFECTS

BE FORWARD LOOKING

TOTAL PROJECT IMPACT

DESIGN
PRODUCTION
TEST
LOGISTICS

RIPPLE EFFECTS

DESIGN CHANGES
STAFFING
MILESTONE CHANGES

ANTICIPATE

CONSIDERING:

    YOUR MISSION REQUIREMENTS
    STATE OF THE ART OF TECHNOLOGY BEING USED
    YOUR CONTRACTOR'S CAPABILITIES
    HIS MANAGEMENT SKILLS

ASK YOURSELF:

    WHAT NEEDS TO BE DONE TO MEET THE NEXT
      MILESTONE?
    WHO'S DOING IT?
    DO YOU HAVE REASONS TO THINK THEY'LL SUCCEED?
    HOW WILL YOU CALIBRATE THEIR PROGRESS?
    DO YOU HAVE ANY ALTERNATIVE OPTIONS?

STATINTL

PRELIMINARY TEST PROCEDURES

TEST OBJECTIVES

EQUIPMENT AND STAFFING

OPERATING PROCEDURES

DETAILED DESCRIPTION

ANALYSIS PROCEDURES

ACCEPTANCE CRITERIA

RELATIONSHIP TO OTHER TESTS

STATINTL

TRANSITION INTEGRATION PLAN

ORGANIZATIONAL ROLES AND MANAGEMENT SYSTEMS
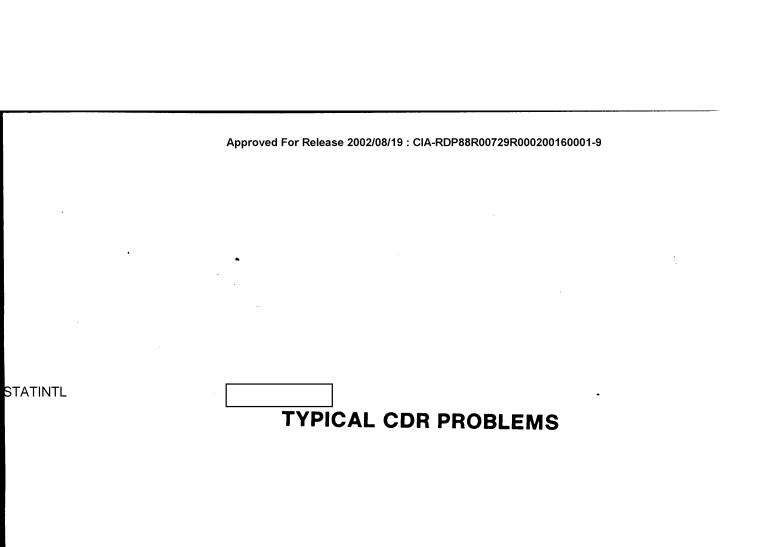SCHEDULES

    IMPACTS

    DEPENDENCIES

BASELINE EVOLUTION

    BASELINE CHANGE SEQUENCE

    INCREMENTAL FUNCTIONAL FLOWS

FACILITY OVERVIEW
OPERATIONAL RESOURCE DEMANDS

    PERSONNEL

    INTERFACES

    SYSTEMS

    MISSION IMPACT

STATINTL

TYPICAL CDR PROBLEMS

STATINTL

DESIGN INCONSISTENCIES

CAUSES

POOR INTERNAL COMMUNICATIONS
AMBIGUOUS INTERFACE SPECIFICATIONS
INEFFECTIVE MANAGEMENT

CONSEQUENCES

WASTED EFFORT
SEGMENT TEST DELAYS

STATINTL

INSUFFICIENT COMPUTER TIME

CAUSES

UNDERSIZED SYSTEM
MISMANAGED RESOURCE
LOW PRIORITY
DEVELOPMENT PLANNING ERRORS

CONSEQUENCES

IMPLEMENTATION AND TEST DELAYS

STATINTL

INADEQUATE TEST FACILITIES

CAUSES

UNRECOGNIZED COMPLEXITY
INEXPERIENCED TEST MANAGER
LACK OF CORPORATE SUPPORT

CONSEQUENCES

UNUSABLE SYSTEM
INTEGRATION PROBLEMS
PROJECT DELAYS

STATINTL

UNSPECIFIED TEST DATA SOURCES

CAUSES

LATE STAFFING

UNRESOLVED TEST TOOLS

CONSEQUENCES

LONG LEAD TIME SCHEDULE IMPACT

GOVERNMENT INHERITED PROBLEM

LESS RIGOROUS TEST PROGRAM

STATINTL

SCHEDULE AND DESIGN BREAKAGE OF TEST PLANS

CAUSES

DEVELOPMENT MILESTONE SLIPS
ENGINEERING OVERSIGHTS
REQUIREMENTS CHANGES

CONSEQUENCES

WASTED EFFORT
COMPRESSED TEST SCHEDULE
INCREASED INTEGRATION TESTING

STATINTL

UNTESTABLE DESIGN

CAUSES

TEST APPROACH UNSPECIFIED AT PDR

CONSEQUENCES

INTEGRATION RISK

STATINTL

IGNORING EVIDENCE OF A SLIP

CAUSES

    CUSTOMER WON'T ACCEPT TRUTH
    MANAGEMENT PRESSURE
    WAITING FOR "GET-WELL"

CONSEQUENCES

    CONTINUED SLIPS
    POOR MORALE

STATINTL

CONFIGURATION CONTROL

IMPLEMENT MANAGEMENT CONTROL OF PRIORITIES

PREVENTS UNNECESSARY CHANGES

ASSURES INTERFACE COORDINATION

PROVIDES ORDERLY INTRODUCTION OF CHANGE